5-2007

The Effect of Instructional Delivery Method on Interaction and Satisfaction in Distance Education Courses at a Community College

Laurie Fladd
Clemson University, lfladd@sc.rr.com

THE EFFECT OF INSTRUCTIONAL DELIVERY METHOD ON INTERACTION AND SATISFACTION IN DISTANCE EDUCATION COURSES AT A COMMUNITY COLLEGE

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Educational Leadership

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by
Laurie Ann Fladd
May 2007

Accepted by:
Frankie Keels Williams, Committee Chair
Lamont Flowers
Barbara Griffin
Larry Grimes

ABSTRACT

The purpose of the study was to investigate the effect of four formats of distance education instructional delivery (Course-in-a-Bag, Instructional Television, Online, and Mixed Mode) on interaction (learner-learner, learner-instructor, learner-content, learner-technology, and overall interaction) and satisfaction. A second purpose was to determine if significant relationships existed between the four types of interaction and satisfaction in each of the four formats of instruction.

Three research questions directed the study. The first explored the dependent variables interaction and satisfaction in each format of instruction for the demographic variables gender, age, and ethnicity.

The second research question was addressed by six null hypotheses. Four of the null hypotheses explored the differences in each type of interaction across the four formats of instruction. The fifth null hypothesis explored differences in overall interaction across the four formats of instructional delivery. The sixth null hypothesis investigated differences in satisfaction across the four formats of instructional delivery.

The third research question was addressed by four null hypotheses. Each null hypothesis examined whether a relationship existed between a type of interaction and satisfaction across the four formats of instructional delivery.

The methodology selected for the study was the research survey design and included the development of a 38-item survey that measured means of the

four types of interaction and satisfaction. The setting of the study was a community college in the Southeastern United States that offered various formats of distance education. Each of the 5,536 students enrolled in distance education in the Fall 2006 semester were invited to take part in the study. Surveys were returned by 1,024 participants at an overall response rate of 18.2%.

Descriptive statistics were conducted on the demographic data to construct a thorough description of the sample. Analysis of variance was used to determine if differences existed in the four types of interaction, overall interaction, and satisfaction among the four formats of distance education instructional delivery. Pearson Product Moment correlation coefficients were generated to determine if relationships existed between the variables of the four types of interaction and satisfaction in each of the four formats of instructional delivery.

The findings indicated that the format of instructional delivery influenced the reported means of learner-learner interaction, learner-instructor interaction and satisfaction. Significant positive relationships existed between learner-learner interaction and satisfaction as well as learner-instructor interaction and satisfaction in all formats of instructional delivery. Learner-content interaction was positively related to satisfaction in all formats except instructional television. Finally, learner-technology interaction was inversely related to satisfaction in the instructional television and online formats of instructional delivery.

DEDICATION

I lovingly dedicate this work to my husband, David and my sons, Jacob and Ian, for their love and support throughout this process. I also dedicate this work to my parents, Edward and Cynthia Romanow, who encouraged education and instilled a belief in myself.

ACKNOWLEDGEMENTS

Writing a dissertation is not a solitary task. This document exists thanks to the time and energy of many wonderful people. First, I would like to thank my advisor, Dr. Frankie Keels Williams, for all her assistance. I am so grateful for her patience, expertise, and support. I would also like to thank my other committee members for their time, input and advice: Dr. Lamont Flowers, Dr. Barbara Griffin, and Dr. Larry Grimes. Many thanks as well to Dr. Roscoe Thornthwaite for his generosity and assistance.

Thanks to my friends who waited patiently for me to emerge from my dissertation cocoon. I am blessed to have too many to name here but they know who they are. Special thanks to Christine Nocito for her editing expertise. I am also grateful to Margaret Woosnam for her support and friendship as we navigated this process together.

Most of all, great gratitude goes to my family. I have three wonderful sisters and a mother and father who empowered me with reminders that I was capable and would "get it done". Finally, none of this would be possible without my boys. Dave, Jake, and Ian thank you for eating take-out and waiting for me to fulfill this very important dream

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CHAPTER I

NATURE OF THE PROBLEM

Different formats of instructional delivery provide different amounts of interaction among the participants in distance education (Anderson, 2004; Anderson, 2003; Roblyer & Wiencke, 2004). Interaction is an essential element in distance education as it impacts knowledge construction, socialization of the student, and satisfaction (Anderson, 2003; Garrison & Shale, 1990; Kelsey, 2000; Parker, 1999; Webster & Hackley, 1997).

According to Anderson (2003), the more independent of time and place of a course, the less interaction is permitted. Richer forms of communication place more restrictions and less independence on time and place. Formats of instructional delivery that are considered low-interactivity include one-way transmission technologies such as correspondence, television, and radio (Anderson, 2004; Robler & Wiencke, 2003). Two-way transmission, such as audio conferencing, video conferencing, and computer conferencing, are considered high-interactivity formats (Anderson, 2004; Roblyer & Wiencke, 2003). Overwhelmingly, interaction is considered an important variable in determining success in distance learning (Gunawardena, 1995; Robler & Wiencke, 2003).

Statement of the Problem

Critics of distance education claim that the separation between the learner and instructor that occurs in distance education detracts from the academic

experience. The separation may result in a lack of interaction and loss of visual cues that can lead to a deficient form of teaching and learning (Kanuka et al, 2002; Peters, 2000; Wonacott, 2002).

Distance education differs from conventional education in the potential isolation of the student (Rovai, 2002; Dupin-Bryant, 2004) and increased discipline and responsibility required by the student to complete the program (Moore, 1973; Potashnik & Capper, 1998). Studies point out that distance education students may feel isolated, feel a lack of social presence, or a lack of engagement because of reduced interaction (Astin, 1999; Gunawardena & Zittle, 1997; Osguthorpe & Graham, 2003). Increased attrition rates that may be attributed to isolation, lack of integration into the institutional fold, lack of student discipline, loss of interest, discouragement, or competing family commitments are also drawbacks of distance education (Carr, 2000; Hay et al, 2004; Keegan, 1996; Potashnik & Capper, 1998). Other researchers caution that instructional telecourses can cause students to feel less involved than traditional students due to distances caused by the technology (Clow, 1999; Kelsey, 2000; McHenry & Bozik, 1995). Online learning is often criticized for lacking a human component (Poole, 2000). These criticisms have traditionally been stumbling blocks in the acceptance of distance education in mainstream higher education.

A significant body of knowledge examined the effectiveness of traditional courses compared to distance courses (Bacon & Jakovich, 2001; Machtmes & Asher, 2000; Murphy, 2000; Whittington, 1987). Although performance was shown to be equivalent between distance courses and traditional courses, student

satisfaction was not always equivalent (Clow, 1999; Maki & Maki, 2003; Murphy, 2000; Russell, 2001).

Few studies compared different formats of distance education instructional delivery to each other with respect to types of interaction and relationship to student satisfaction. Moreover, few studies investigated distance education in two-year institutions even though public two-year schools enroll more distance learners than any other area of higher education (Allen & Seaman, 2004). This study was conducted in order to determine the effects of distance education instructional delivery on interaction and student satisfaction in the two-year student population.

Purpose of the Study

The primary purpose of this study was to examine student interaction and satisfaction across four formats of distance education instructional delivery of courses at a two-year community college located in the Southeastern United States. More specifically, the purpose of the study included three objectives. The first objective of the study was to examine the effect of four distance education instructional delivery formats (Course in a Bag, instructional television, online and mixed mode) on interaction (learner-learner, learner-instructor, learner-content, learner-technology, and overall). The second objective of the study was to investigate the effect of the four distance education instructional delivery formats on student satisfaction in those courses. The third objective of the study was to determine the relationship between the four types of interaction and

satisfaction for each of the four formats of distance education instructional delivery.

Research Questions

This quantitative study examined interaction and satisfaction across four formats of distance education instructional delivery at a two-year community college in the Southeastern United States. In order to determine the effect of the distance education instructional delivery formats on interaction and satisfaction, the following research questions guided the study:

1. How do students enrolled in four formats of distance education instructional delivery perceive interaction and satisfaction?
2. Do perceptions of interaction and satisfaction differ among students enrolled in four formats of distance education instructional delivery?
3. Do significant relationships exist between the perceptions of interaction and satisfaction of the students enrolled in four formats of distance education instructional delivery?

Research Methodology

The quantitative methodology used for this study included the research survey design. Students participating in distance education courses at a two-year community college in the Southeastern United States were surveyed using a web-based instrument. A 38-item instrument was designed, pilot tested, revised, and

administered for the study. The data were collected from students enrolled in four formats of distance education instructional delivery during Fall 2006. The data were analyzed using the statistical software SPSS version 14.0. Descriptive statistics, analysis of variance, and Pearson Product Moment correlations were calculated for the Fall 2006 data. Finally, the results were interpreted as they related to the research questions and relevant literature.

Theoretical Framework

Moore's *Theory of Transactional Distance* (1997) served as the theoretical framework for this study. Moore's theory states that transactional distance is a pedagogical distance that exists between learners and instructors separated by geographic distance. The theory suggests that transactional distance is influenced by the dialogue (interaction) that exists in the course, the program structure, and the autonomy of the students. This study examined the effect of the environment (format of distance education instructional delivery) on interaction and satisfaction as well as relationships between environment, interaction, and satisfaction.

Conceptual Framework

The conceptual framework for this study encompassed independent and dependent variables related to the three research questions. The first research question sought to examine the perceptions of interaction and satisfaction in each

of the four formats of distance education instructional delivery. The dependent and independent variables for research question one were as follows:

Dependent Variables: Perceived interaction (learner-learner, learner-instructor, learner-content, and learner-technology) and satisfaction were the dependent variables.

Independent Variables: The distance education instructional delivery format for courses (Course-in-a-Bag, Instructional Television, online, and Mixed Mode) and the demographic variables of the students were the independent variables. The demographic variables included gender, age, and ethnicity.

The purpose of the second research question was to examine the effect of four formats of distance education instructional delivery on interaction and satisfaction. The dependent and independent variables for research question two were as follows:

Dependent Variables: Perceived interaction (learner-learner, learner-instructor, learner-content, learner-technology, and overall) and satisfaction were the dependent variables.

Independent Variables: The distance education instructional delivery formats for courses (Course-in-a-Bag, Instructional Television, online, and Mixed Mode) were the independent variables.

The third research question addressed relationships between the types of interaction and satisfaction for the four distance education instructional delivery

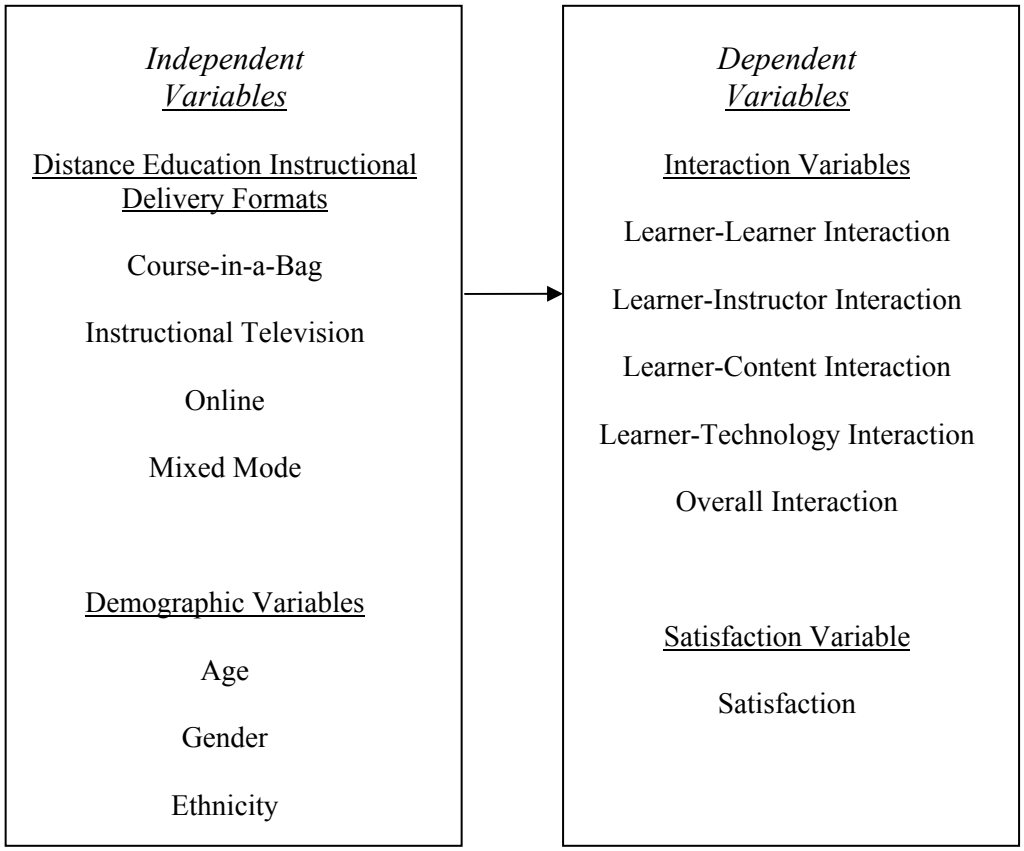
formats. The dependent and independent variables for research question three were as follows:

Dependent Variables: Perceived interaction (learner-learner, learner-instructor, learner-content, and learner-technology) and satisfaction were the dependent variables.

Independent Variables: The distance education instructional delivery format for courses (Course-in-a-Bag, Instructional Television, online, and Mixed Mode) were the independent variables selected for this portion of the study.

In order to determine if a relationship existed, a Pearson Product Moment correlation was calculated between the dependent variables. Figure 1 shows an illustration of the conceptual framework used for this study.

Figure 1. Conceptual Framework of the Study



Definition of Terms

The following are definitions of terms used to describe major concepts throughout this study.

Asynchronous communication: Asynchronous communication occurs with a delay where the participants respond at a different time from when the message is sent (Moore & Kearsley, 2005).

Course in a Bag: Course in a Bag is a self-paced format of instruction that allows students to complete their coursework in their own home. Students receive their information by viewing pre-recorded lessons on videotape, audiotape, DVD, or CD. Interaction with the instructor can take place via telephone, campus visits

(face-to-face), postal mail or e-mail. Course exams are administered in the testing center on campus.

Distance education: Moore and Kearsley (2005) define distance education as "planned learning that normally occurs in a different place from teaching, requiring special course design and instruction techniques, communication through various technologies, and special organizational and administrative arrangements (p. 2)."

Instructional Television: Instructional television is a format where delivery of course material occurs through compressed video and broadband systems to other campuses in the area or to area high schools. Interaction with the instructor and other students can take place face-to-face if they are all present at the same site. Interaction with the instructor and students at other sites takes place via the compressed video/broadband system.

Interaction: Interaction defined as reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another (Wagner, 1994). In this study, interaction measures the overall interaction a student reports/experiences for a given distance education course during the Fall semester of 2006. Interaction is based on the average of each student's response to 26 questions on the Fall 2006 Interaction and Satisfaction survey. The items included learner-to-learner interaction, learner-to-instructor interaction, learner-to-content interaction, and learner-to-technology interaction.

Learner-to-content interaction: The learner-content construct measures the interaction perceived to occur between the student and the materials that contain the content for the distance education course (Moore, 1998). The variable is based on the average of each student's response to 6 questions on the Fall 2006 Interaction and Satisfaction survey. The items included information concerning course content received from the Internet, e-mail, DVD, telephone, videotape, CD, postal mail, or from the instructor.

Learner-to-instructor interaction: The learner-instructor construct measures the interaction perceived to occur between the student and the instructor in a distance education course (Moore, 1998). The variable is based on the average of each student's response to 7 questions on the Fall 2006 Interaction and Satisfaction survey. The items included information concerning asking and responding to questions from the instructor, and the perceived positiveness of the interaction between the student and the instructor in the distance education course.

Learner-to-learner interaction: The learner-learner construct measures the interaction perceived to occur between students in a distance education course (Moore, 1998). The variable is based on the average of each student's response to 8 questions on the Fall 2006 Interaction and Satisfaction survey. The items included information concerning asking questions and responding to questions/messages from other students; group work; and the perceived positiveness of the interaction between students in the distance education course.

Learner-to-technology interaction: The learner-technology construct measures the interaction perceived to occur between the student and the

technology he/she is using to access course content (Hillman, Willis, & Gunawardena, 1994). The variable is based on the average of each student's response to 5 questions on the Fall 2006 Interaction and Satisfaction survey. Items included information concerning the ease of use of the technology, prior experience with the technology, and whether problems with technology interfered with participation or assignment completion.

Mixed Mode: Mixed Mode courses are a combination of traditional lecture and online courses. Mixed Mode delivery combines a weekly face-face meeting with at least one asynchronous activity. The goal is to familiarize the students with the material online before the weekly face-to-face discussions. Examinations can be administered either online or via the testing center on campus, at the discretion of the instructor.

Online: Online courses include delivery of course materials through the Internet. Students are encouraged to both synchronously and asynchronously participate and interact with other students via threaded discussions, online collaboration, and virtual group projects. Quizzes are often auto-graded and offered online. Examinations can be administered either online or via the testing center on campus, at the discretion of the instructor.

Satisfaction: This construct measures the overall satisfaction a student reports/experiences during the extent of their distance education course in the Fall semester of 2006. The variable is based on the average of the each student's response to 12 satisfaction items on the Interaction and Satisfaction survey administered in the Fall semester of 2006. The items included satisfaction with

the instructor/instruction, technology, course management, promptness of delivery of material, support services, and out-of-class communication with the instructor.

Synchronous communication: Synchronous communication is interactive communication with no time delay (Moore & Kearsley, 2005).

Significance of the Study

Distance education courses are taught in a variety of instructional delivery formats at two-year colleges. These instructional delivery formats include one-way video, sometimes called Course-in-a Bag; compressed video (audio and voice), sometimes called Instructional Television; online or Internet; and blended (the face-to-face format plus online component), sometimes called Mixed Mode. In the 2004-05 academic year, approximately 93% of all public two-year institutions offered distance learning opportunities (Chronicle Almanac, 2006). The National Center for Education Statistics (NCES, 2002) reported that during the 2000-2001 academic year 40% of community colleges offered real-time synchronous communication in their online courses while 95% offered the more flexible asynchronous communication. Instructional television courses were offered by 60% of two-year schools and one-way video courses were offered by 57% of two-year schools during 2000-2001 (NCES, 2002). Online courses remained the most popular with nearly 3.2 million students enrolled in at least one online course during the Fall 2005 semester (Allen & Seaman, 2006).

Although significant evidence shows that distance education is equally as effective as traditional classroom instruction in terms of academic performance

(Russell, 2001), another significant indicator of effectiveness is satisfaction (Pascarella et al, 1996). Student satisfaction serves as an indicator of how successful various distance education instructional delivery formats are with a two-year student population (Noel Levitz, 2004; Pascarella et al, 1996).

The study of distance education courses in various instructional delivery formats is important to administrators as they create strategic plans for investment in quality distance education for their institutions (Howell, Williams, & Lindsay, 2003; Potashnik & Capper, 1998). The effect of distance education instructional delivery formats on interaction and satisfaction is of particular importance to administrators of two-year community colleges since they enroll more distance learners than any other area of higher education (Allen & Seaman, 2004). Additionally, the results of this study may play a significant role in training faculty to design the most satisfying distance education courses for their students (Kelsey, 2000; McIsaac and Blocher, 1998). This study contributes to the existing body of knowledge concerning instructional delivery formats of distance education on interaction and satisfaction in an understudied population (two-year community colleges).

Delimitations

The study was confined to an examination of the effect of distance education instructional delivery on interaction and satisfaction delimited to a single two-year institution in the Southeastern United States. This sample for this study consisted of students enrolled in distance education courses in a single two-

year institution in the Southeastern United States in the Fall 2006 semester. The study was further narrowed to students who received the invitation to participate in the survey via their e-mail addresses. The intent of this study was to add to the body of literature on interaction and satisfaction in various distance education instructional delivery formats with two-year student populations.

Organization of the Study

This study is divided into five chapters. The first chapter includes an introduction to the prevalence of distance learning in higher education and specifically at two-year colleges. The research problem and purpose of the study follow the introduction. Next, research questions, methodology, and definition of terms are provided. Finally, the significance of the study and delimitations conclude the introduction chapter.

The second chapter provides a thorough review of literature on distance education in higher education that includes its history, formats of instructional delivery, interaction in distance education in higher education, and satisfaction in distance education in higher education. The chapter also includes a summary of the literature on distance education students and the theoretical framework.

The third chapter covers the research questions and includes the survey research design and methodology used in this study. This section also presents information on data collection and data analysis procedures used in the study. Finally, the chapter concludes with information on the institution.

The fourth chapter presents the results of the analysis of the survey data. Descriptive statistics of the survey participants and statistical results from the analysis of variance and Pearson Product Moment correlations used to address the research questions are presented.

The fifth chapter includes a summary of the findings and presents conclusions of the study. General recommendations, recommendations for further research, and implications for distance education in higher education institutions are presented in the chapter.

CHAPTER II

REVIEW OF THE LITERATURE

"The emergence of new technologies does not change the goals of education. The new technologies change the process of communication within an educational setting to accomplish these goals" (Allen et al, 2004, p. 402).

The purpose of this chapter is to present the relevant literature pertaining to the effects of four formats of distance education instructional delivery on interaction and satisfaction. General information on distance education, types of interaction, formats of distance education instructional delivery, characteristics of students, and relevant theory were reviewed to provide guidance to the study.

This chapter contains seven sections. The first section contains general information on distance education and the second includes a definition of distance education used in the study. In the third section, Moore's *Theory of Transactional Distance* is reviewed with related studies on transactional distance. The history of distance education is included in section four followed by information on the distance education student in section five. The sixth section covers interaction, including a description of four types of interaction in distance education. Finally, section seven contains information on the four formats of distance education instructional delivery examined in the study.

General Information on Distance Education

In the 2000-2001 academic year over three million students were estimated to be enrolled in all distance education courses offered by two-year and four-year institutions of higher education in the United States (Waits, Lewis & Greene, 2003). Two-year institutions are the largest providers of distance education in higher education (Chronicle Almanac, 2006). In the 12-month 2004-2005 academic year, 93.5% of the two-year public institutions offered distance education courses (Chronicle Almanac, 2006). Public two-year institutions enrolled the most distance learners in 2000-2001 with approximately 1.47 million or about 48% of total distance enrollments in higher education. In comparison, public four-year institutions enrolled 945,000 or about 31% of the total distance enrollments in higher education (Waits, Lewis, & Greene, 2003). Moreover, the demand for distance education is international. Programs exist in many countries throughout the world including Mexico, Africa, and China. (Potashnik & Capper, 1998).

A major benefit of distance education is to provide opportunities for higher education to student populations that may lack access for any number of reasons (Bacon & Jakovich, 2001; Bower, Kamata, & Smith, 2001; Irons, Keel, & Bielema, 2002; Kanuka et al, 2002; Kanuka, 2001; Maxwell, Richter, & McCain, 1995; Miller & Honeyman, 1993; Moore & Kearsley, 2005; Garrison & Shale, 1990, Sherow & Wedemeyer, 1990; Sorensen, 1996; Warren & Holloman, 2005; Wheeler, Batchelder, & Hampshire, 1996; Willis, 1992). Other benefits include updating skills such as teacher training and emergency training, improving the

cost effectiveness of particular courses/programs, supporting the quality of existing education, adding an international dimension to education, and providing classroom extension programs for both K-12 and higher education (Maxwell, Richter & McCain, 1995; Moore & Kearsley, 2005; Potashnik & Capper, 1998). Distance education gives students the opportunity to interact with other students of diverse backgrounds and can provide access to outside speakers not otherwise available to the institution (Comeaux, 1995; McDonald, 2002; Wheeler, Batchelder, & Hampshire, 1996; Willis, 1992).

Distance Education Defined

The use of technology alone does not constitute distance education. In order to distinguish a true distance education course from a traditional course that uses technology as an aide, Moore and Kearsley (2005) suggested examining the location of day-to-day decision-making and learning. Determining appropriate terminology and defining distance education became more challenging as the field expanded and technology developed. Terms often used interchangeably with distance education include correspondence study, home study, independent study, external study, distance teaching, and distance learning (Keegan, 1996).

Notably, since the 1990s the term "distance learning" has increased in use (Keegan, 1996). According to Keegan (1996), the currently agreed upon term that is most appropriate to use when describing this educational phenomena is *distance education*. As such, distance education should be differentiated from distance learning. Education in general is concerned not only with learning but

with teaching as well. Therefore, the literature suggests it is inappropriate to interchange the term "distance learning" with "distance education" since distance education encompasses both distance teaching and distance learning (Keegan, 1996; Moore & Kearsley, 2005).

Early definitions of distance education were based on early formats of distance education instructional delivery, such as correspondence education (Garrison & Shale, 1990). In an attempt to assemble a comprehensive definition of distance education Keegan proposed in 1980 and revised in 1996 five characteristics that are inherent to all forms of distance education. These main characteristics included:

> 1. The quasi-permanent separation of teacher and learner
> 2. The influence of an educational institution
> 3. The use of technical media to "unite teacher and learner" and to carry course content
> 4. The option of two-way communication to enable dialogue
> 5. The "quasi-permanent" absence of the learning group where students are primarily instructed as individuals with the possibility of meeting through either face-to-face or electronic means for didactic and socialization purposes (Keegan, 1996, p. 50).

Garrison and Shale (1987) attempted to define distance education apart from the instructional technology. The researchers proposed three criteria useful for classifying a course as distance education independent of the technology implemented. These criteria suggested that (Garrison & Shale, 1987, p. 11)

1. Distance education implies that the majority of the communication between student and instructor occurs noncontiguously.
2. Distance education must involve two-way communication to facilitate the educational process
3. Distance education makes use of technology to mediate the two-way communication

The definition by Garrison and Shale (1990) also described distance education as intentional and systematic which helped to differentiate distance education from simply independent learning.

Moore and Kearsley (2005) defined distance education as "planned learning that normally occurs in a different place from teaching, requiring special course design and instruction techniques, communication through various technologies, and special organizational and administrative arrangements" (p.2). This description reinforced earlier definitions by emphasizing both planned learning and teaching, learning where the student and teacher are usually separated, and finally communication using various technologies.

Moore's Theory of Transactional Distance

The purpose of theory in distance education is to explain and predict current and future practices (Garrison, 2000, Creswell, 2003). Anderson (2004) states that having theories in online learning can help educators better invest their limited resources.

Moore's *Theory of Transactional Distance* (1997) suggests that the distance in distance education is much more than a geographic phenomenon. The separation of the learner from the instructor results in a lack of integration of the student into institutional life, causes the student to feel isolated, and poses a problem to effective distance education (Wolcott, 1996; Keegan, 1996). In fact, the distance that separates the learner from the instructor is pedagogical and is best bridged by a learner-centered approach that includes interaction (Moore, 1997; Moore & Kearsley, 2005; Wolcott, 1996). Transactional distance is explained as the "physical distance that leads to a communications gap, a psychological space of potential misunderstandings between the instructors and the learners that has to be bridged by special teaching techniques" (Moore & Kearsley, 2005, p. 224). Moore indicates that transactional distance is a continuous as opposed to discrete variable and many different degrees are possible. The amount of transactional distance between a student and instructor depends upon the variables dialogue, program structure, and learner autonomy (Moore, 1997).

Dialogue is described as positive interactions or series of interactions that results in improved understanding for the student (Moore, 1997; Moore & Kearsley, 2005). According to Moore, dialogue is "purposeful, constructive and valued by each party" (Moore, 1997, p. 23). Dialogue is often used interchangeably with interaction, however, it is slightly different in that interaction includes both positive and negative encounters. Dialogue in the *Theory of Transactional Distance* includes only positive interactions (Moore,

1997). An increase in dialogue reduces transactional distance and builds a sense of community (Moore & Kearsley, 2005; Rovai, 2002; Christianson, Tiene, & Luft, 2002).

Dialogue is dependent on several factors including the educational philosophy of the party responsible for course design, the level of instruction, the personalities of the instructor and the learner, the subject matter, and finally environmental factors (Moore, 1997). The most important environmental factor is the medium of communication (Moore, 1997; Moore & Kearsley, 2005). It is possible to manipulate the nature of the medium and the opportunities available in a particular format of instruction to offer the most dialogue while reducing transactional distance and perhaps improving student satisfaction (Hackman & Walker, 1990; Moore, 1997; Rovai, 2002; Rovai, 2002b). Moore (1997) indicated that the advent of "powerfully dialogic" media such as interactive telecommunication has allowed creation of learner-learner dialogue (p. 27). Advantages of networks of learner-learner dialogue include creation, testing, and evaluation of knowledge in a self-paced environment (Moore, 1997). In essence, interactive instruction helps to move students toward constructive knowledge creation (Moore, 1997; Tait, 2003).

Other important environmental factors include number of students, numbers of opportunities for communication, and finally the emotional status of both instructor and learner (Moore, 1997). The interactive nature of the medium of communication is a major determinant of the extent and quality of the dialogue. Programs that allow more spontaneous, interactive, real-time communications are

more likely to bridge the transactional gap then less flexible recorded media (Moore, 1997).

The program structure reflects the flexibility of the program or the ability to accommodate individual learners (Moore, 1997). Similar to dialogue, structure is impacted by the instructors, the educational philosophy employed, the level of instruction, the content, and finally the medium of communication (Moore, 1997; Moore & Kearsley, 2005). Levels of structure and dialogue determine the amount of transactional distance in an educational program. For example, a program that is highly structured with little dialogue demonstrates a large transactional distance between the learner and instructor. Alternately, a program that is less structured with large amounts of dialogue demonstrates less transactional distance between the student and the instructor (Moore, 1997). Lee and Gibson (2003) found that low structure and high interaction allowed the learner to take control and responsibility for their learning. Reducing structure and increasing dialogue are two ways to build community and reduce transactional distance between participants (Rovai, 2002; Moore, 1997). The nature of the learner is also important to understand to efficiently structure a course (Moore, 1997).

Learner autonomy is defined by Moore as the "extent to which in the teaching/learning relationship it is the learner rather than the teacher who determines the goals, the learning experiences, and the evaluation decisions of the learning programme" (Moore, 1997, p.26). Knowles (1970) indicated that students usually are not prepared for self-directed learning because they are taught to be dependent learners in the school system. However, as learners mature they

become more independent (Merriam, 2001). According to Moore (1997), more autonomous learners are comfortable with less dialogue and structure and vice versa. As the learner develops a shared understanding of the content through interaction and dialogue then control of the learning process will shift from the instructor to the learner (Moore & Keegan, 2005).

Related Literature on Transactional Distance

According to Garrison (2000) current educational theory is shifting from structural to transactional. Two articles by Gorsky and Caspi (2005, 2005b) indicated that Moore's theory was limited by fact that the variables were not operationally defined and therefore were difficult to study empirically. Garrison (2000) indicated that the interrelationships between the constructs of dialogue, structure and learner autonomy were not clearly stated. Current studies on the theory of transactional distance vary from studies that tested the theory as written to studies that operationalized the variables to better test the theory.

Investigation of the theory in various environments and on learning outcomes was conducted. Graduate nursing students enrolled in instructional television courses reported more dialogue with their instructors than similar students in traditional nursing courses suggesting that course format influenced dialogue (Bischoff et al, 1996). Similarly, offering e-mail seemed to increase dialogue and reduce transactional distances in courses as compared to courses that did not utilize e-mail (Bischoff et al, 1996).

Chen and Willits (1998) also offered partial support of the theory of transactional distance in a videoconferencing environment. The study tested the

effects of dialogue, course structure, learner autonomy, and perceived transactional distance on student's perceived learning (Chen & Willits, 1998). The frequency of in-class discussion (dialogue) was directly related to perceived learning (Chen and Willits, 1998). According to the study, transactional distance between the teacher and the learners was indirectly related to perceive learning. In other words, students who perceived greater learning also reported less transactional distance.

Support for the theory of transactional distance was provided in an online environment as well. Chen (2001) examined factors that contributed to transactional distance in a web course. Exploratory factor analysis revealed four slightly correlated dimensions of transactional distance that characterized overall transactional distance in a web-based course. According to the study, learner-learner, learner-instructor, learner-content, and learner-technology were the four dimensions that characterized overall transactional distance (Chen, 2001). These dimensions reflected the four types of interaction proposed by Moore (1989) and Hillman, Willis, and Gunawardena (1994). Moore (1989) introduced learner-learner, learner-instructor, and learner-content interaction while Hillman, Willis, & Gunawardena (1994) followed with learner-technology interaction. Chen suggested the study was significant because it can make distance educators more effective at utilizing various types of interaction to reduce the various dimensions of transactional distance (Chen, 2001).

A different study by Chen (2001b), measured perceived transactional distance in students. The independent variables included student skill level with

the Internet, previous experience with distance education, type of learner support received, and finally the amount of online asynchronous interaction. Regression analysis revealed that student skill level with the Internet and the extent of online asynchronous interaction were the only two independent variables to influence perceived transactional distance. Specifically, both student skill with the Internet and extent of online asynchronous interaction had a negative influence on learner-interface transactional distance. In other words, the more technologically skilled a student was the lower the perceived transactional distance. Additionally, the more asynchronous online interaction a student experienced, the less transactional distance was perceived (Chen, 2001b). Vandergrift (2002) suggested that the "restrained" presence of an instructor also reduced perceived transactional distance in an online instructional delivery course format. Finally, Kanuka (2001) and Kanuka et al (2002) reported that the autonomous nature of the learner may influence transactional distance in the online environment.

History of Distance Education

Although popular today, distance education is certainly nothing new on the education radar. The history of distance education has progressed through the development of correspondence education, educational radio, educational television, and computer-assisted instruction.

Correspondence Education

The principle purpose of correspondence education, one of the earliest forms of distance education, was to provide educational opportunities for those not previously served using current technologies (Moore & Kersley, 2005). Correspondence education was initiated in Europe in 1844 by Isaac Pitman and had its roots in this country with Anna Ticknor in 1873 (Tait, 2003). To encourage advancement of women of all classes, Ticknor created *The Society to Encourage Studies at Home* (Moore & Kersley, 2005; Nasseh, 1997; Parker, 1999; Shale & Garrison, 1990; Sherow & Wedemeyer, 1990). The first official recognition of correspondence education in the U.S. came in 1883-1891 by Chautauqua College of Liberal Arts (Moore & Kersley, 2005; Nasseh, 1997; Sherow & Wedemeyer, 1990). William Rainey Harper developed the first formal program of university distance education in 1892 at the University of Chicago (Moore & Kersley, 2005). Correspondence education continued to grow into the twentieth century.

The literature clearly shows that correspondence education was popular in the U.S. and around the world (Garrison & Shale, 1990). In 1946 South Africa established an exclusively distance teaching university, the University of South Africa (UNSIA) that helped provide the educationally excluded with educational opportunity (Tait, 2003). By 1958 an estimated two million Americans were being educated using correspondence education (Garrison & Shale, 1990). In 1969 a comprehensive study by the National Home Study Council (NHSC) and the National University Extension Association (NUEA) reported that about three

million Americans were studying using correspondence study. Of these three million students, approximately 50% were in the armed services (Moore & Kearsley, 2005).

Educational Radio

Radio broadcasting became the new promise for distance education in the early 1900s. Educational radio was pioneered in 1920 to serve as a supplement to correspondence education (Sherow & Wedemeyer, 1990). The first educational radio license was issued to the Latter Day Saints' University in 1921. By 1925 the first for-credit radio courses were offered by the State University of Iowa (Moore & Kersley, 2005). According to Moore & Kersley (2005), radio as a delivery medium did not live up to expectations and never really gained popularity. The "self-constructing" nature and lack of opportunity for interaction were two reasons the instructional delivery format never achieved vast use (Parker, 1999, p. 13). By the mid-twentieth century, educational radio served as a stepping stone to educational television.

Educational Television

The purpose of early educational television was to supplement correspondence courses (Sherow & Wedemeyer, 1990). In 1952 a few hundred TV channels were set aside for educational use only (Moore & Kersley, 2005; Sherow & Wedemeyer, 1990). A big burst of activity in the development of alternatives to traditional education occurred in the 1960s and 1970s in response to changing social climate and needs such as low cost and convenience (Miller & Honeyman, 1993; Nasseh, 1997). New formats of distance education

instructional delivery included videotape, programmed instruction, and other multimedia methods (Nasseh, 1997). Until the 1970s most televised communication was one-directional audio and video transmission (Moore & Kersley, 2005). The late 1970s and early 1980s brought about the use of cable and satellite TV as a delivery medium for one-directional audio and video distance education courses (Moore & Kersley, 2005; Nasseh, 1997). Teleconferencing with audio conferencing capabilities was also used later in the same time period. Teleconferencing allowed two-way audio interaction in real time.

Computer-Assisted Instruction

No technological advancement transformed the distance education landscape like the development of the personal computer in the late 1980s and the World Wide Web in the early 1990s (Moore & Kersley, 2005). This era ushered in the advancement of the personal computer and fiber optic cable and with it the capabilities of two-way video conferencing where participants could see as well as hear each other (Moore & Kersley, 2005).

The Internet has helped remove the walls from traditional education (Potashnik & Capper, 1998). Students enrolled in online courses have the ability to communicate synchronously, in real time, or asynchronously, at their leisure (Palloff & Pratt, 1999). Online courses exploded in popularity with over three million students enrolled in 2005 (Allen & Seamen, 2006). Blended formats that combined online courses with traditional face-to-face interactions also were developed.

The Distance Education Student

A 2005 report of community college students indicated that learners placed value on the quality of instruction and the cost and reputation of the institution, as well as the availability of classes at convenient times (Noel-Levitz). Adult students take distance learning courses for a number of reasons including convenience, finances, access to education, access to experts, and access to a diverse student population (Miller & Honeyman, 1993; Willis, 1992; Muirhead, 2000).

Characteristics

Several studies were done that compared the traditional student to the distance education student. Although it was difficult to paint a uniform picture of typical distance education students because they were very diverse, some constants existed. For example, more distance learners were female, older, and lived farther from campus than their non-traditional counterparts (Dutton, Dutton, & Perry, 2002; Valentine, 2002; Sullivan, 2001; Heiens & Hulse, 1995; Wilson, 1991). Online students also seemed to have more outside responsibilities than their traditional classroom counterparts. Dutton, Dutton, and Perry (2002) indicated that online students had greater work and childcare responsibilities.

In general, older, adult students are conscientious learners. However, many lacked the initial experience required to be successful as a distance student (Daniel and Marquis, 1979). Being an autonomous learner, as is required in distance education, was not inherent in most students (Knowles, 1970). Learners

did not always enter distance courses prepared to engage in analytical discourse (Garrison & Cleveland-Innes, 2005).

Most students came out of the K-12 system as dependent learners and thus needed to be taught the skills to become autonomous learners (Muirhead, 2000; Moore, 1997; Knowles, 1970; Peters, 2000). Studies showed that he distance education instructional delivery format required learners to be more motivated, focused, independent, organized, responsible with their time, and willing to collaborate in a group than traditional learners (Valentine, 2002; Muirhead, 2000; Rowntree, 1995). It was shown that it was critical to a distance student's success that he/she was able to work independent of an instructor and able to listen actively (Sherry, 1995).

Technological experience of the student influences learner perceptions in a distance education course. An "induction crisis" may occur in older students required to use unfamiliar technology in a distance education course (Daniel and Marquis, 1979, p. 36). As a result, a warm-up period may be required to prepare students for the new learning environment (Garrison & Cleveland-Innes, 2005; Brown, 2001; Anderson, 2003, Rowntree, 1995). In general, less experienced learners participated less frequently in distance education (Brown, 2001, Vrasidas & McIsaac, 1990). Additionally, less experienced students reported greater anxiety, felt more isolated, and often required more support and encouragement at the beginning of a course (Brown, 2001).

Interaction

Definition of Interaction

In its most basic form education is an "interaction among teacher, student, and subject content" (Garrison & Shale, 1990, p. 31). Wagner (1994) broadly defined interaction as "reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another" (p. 8). More specifically, Wagner (1994) defined instructional interaction as "an event that takes place between a learner and the learner's environment" (p. 8). The purpose of instructional interaction is to change the learner in a way that moves him/her toward a stated goal (Wagner, 1994). Roblyer & Wiencke (2003) stressed the social and instructional exchanges and the influence of technology on interaction. Although the definition of interaction can be complex, it can easily be described as the connectivity that students feel to their instructors and their fellow students (Sherry, 1995).

Functions of Interaction

Interaction was a critical element in distance education with respect to performance, knowledge creation, quality, and satisfaction (Anderson, 2003b; Chen, 2001; Durrington, Berryhill, & Swafford, 2006; Garrison & Shale, 1990; Hay et al, 2004; Jung, et al, 2002; Keegan, 1996; Littleton & Whitelock, 2005; Meyer, 2003; Parker, 1999; Saba, 2000; Sherry, 1995; Wagner, 1994; Webster & Hackley, 1997). Interaction helped learners process their instructional content (Anderson, 2003b; Holmberg, 1989; Kinzie, 1990; Schaffer & Hannafin, 1993;

Wagner, 1994). Moreover, extensive interaction with a teacher and other students was necessary to the construction and deconstruction of knowledge (Anderson, 2003; Parker, 1999; Shale & Garrison, 1990). Providing interaction in education was important because interaction reinforced feedback which allowed learners to judge (and have judged) the quality of their performance. The literature clearly indicated that student perception of interaction helped to determine the quality of a course which may influence satisfaction as well (Roblyer & Ekhaml, 2000; Zirkin & Sumler, 1995).

Interaction also was important for socializing the learner as well as setting the pace of studies (Pascarella & Terenzini, 2005; Anderson, 2003; Daniel & Marquis, 1979). Interaction was critical for effective communication (Schramm, 1954) and community building (Rovai, 2002), and was achieved through the "interplay of social, instructional, and technological variables" (Robler & Wiencke, 2003, p. 85). Increased social interaction contributed to classroom community, student satisfaction, and retention (Rovai, 2002; Rovai, 2002b; Tinto, 1975; Cutler, 1995).

Providing an opportunity for learner-learner and learner-instructor interaction helped promote success and satisfaction in distance education (Sherry, 1995). Interaction contributed to effectiveness by providing more learner autonomy and motivation (Anderson, 2003b; Holmberg, 1989; Kinzie, 1990; Schaffer & Hannafin, 1993; Wagner, 1994). Zhang and Fulford (1994) suggested that the way a student perceived interaction was more important than the actual amount of time spent interacting. Their study indicated that the creation of a

participatory community in which there was a large amount of perceived vicarious interaction positively impacted student satisfaction (Zhang, Fulford, 1994). According to Hackman and Walker (1995), when a system "allows interactivity and control, and when instructors are immediate and present, students learn more and are more satisfied with the experience regardless of the modality" (p. 50).

Four Types of Interaction

Four common types of interaction were described in the distance education literature (Anderson and Garrison, 1998; Hillman, Willis, & Gunawardena, 1994; Moore, 1989). These four common types of interaction included learner-learner, learner-instructor, learner-content, and learner-technology interaction (Hillman, Willis, & Gunawardena, 1994, Moore, 1989). According to Moore (1989), it was essential that instructors maximixed their technology and planned to offer opportunities for all types of interaction to distance education students.

Learner-Learner Interaction

Learner-learner interaction was represented by the "interaction between one learner and other learners, alone or in group settings, with or without the real-time presence of an instructor" (Moore, 1989, pg 3). Learner-learner interaction can be task or socially oriented (Jung et al, 2002). Task-driven interaction was usually under the control of the instructor and was a more formalized form of

interaction. Social interaction resulted from self-generated information sharing between students (Jung, 2002).

Moore (1989) claimed learner-learner interaction was important for learning and may serve other purposes depending on the age and level of the student. Learner-learner interaction was stimulating and motivating to students, especially to younger, less experienced students (Moore, 1989; Moore & Kersley, 2005; Anderson, 2003; Amundsen & Bernard, 1989). Pascarella and Terenzini (2005) indicate that influence from fellow students is a positive contributor to persistence decisions. Distance education instructional delivery formats that provide learner-learner interaction forced the student to reconstruct knowledge in a deeper sense and gave students skills that were critical to personal and professional success (Anderson, 2003; Moore, 1989; Jonassen, 1991).

According to Wegerif (1998), student collaboration was an important part of the learning process. Collaborative learner-learner discussions were valuable to help students process and test content presented by the instructor (Moore & Kearsley, 2005). Additionally, peer interaction was considered valuable because it assisted students in developing perspectives outside their own (Anderson, 2004; Hay et al, 2004).

Studies on Learner-Learner Interaction. The literature provided evidence that learner-learner interaction was important for learning in a distance education setting. A 1998 study questioned eight experts in the field of distance education and asked each participant the type of interaction he/she felt was essential to online learning (Soo & Bonk, 1998). The highest-ranking form of interaction was

asynchronous learner-learner interaction emphasizing the importance of the learner in online instruction (Soo & Bonk. 1998). Anderson (2003b) stated that web-based courses rich in text-based communications allowed for extensive interaction between students and reduced the reliance on student-instructor interactions.

Learner-Instructor Interaction

Learner-Instructor interaction was regarded as essential by most educators and was in high demand by learners (Anderson, 2003; Garrison & Shale, 1990; Moore, 1989; Moore & Kearsley, 2005). This type of interaction can be task or socially oriented as well (Jung et al, 2002). Holmberg (1978) indicated that continuous interaction between the student and the instructor created a type of conversation that promoted feelings of personal relation that can improve satisfaction and learning.

Learner-Instructor interaction was important because it personalized a course for the student (Moore, 1989; Moore & Kearsley, 2005). In general, the distance instructor attempted to stimulate interest in the subject, directed the application of knowledge, and finally provided some level of support, encouragement, or counsel to assist in course completion. Additionally, learner-instructor interaction was essential as the instructor guided the student in learning the content. Interaction with an instructor allowed a student to check his/her new knowledge against the reference of the instructor (Garrison & Shale, 1990). Specifically, the learner was able to draw on the expertise of the instructor while processing the content in an individual way (Moore & Kearsley, 2005). As

Moore (1997) indicated, distance learners are "vulnerable at the point of application, since they do not know enough about the subject to be sure they are applying it correctly" (p. 25). Learner-instructor interaction was most valuable in the distance learning environment for providing feedback and for reality testing of knowledge (Moore, 1997). Pascarella and Terenzini (2005) suggest that interaction with faculty members outside the classroom helps with integration into the institution and relates to persistence.

Studies on Learner-Instructor Interaction. The literature indicated that learner-instructor interaction was important to distance education students. For example, two studies of graduate students in 2004 indicated that frequent interaction with instructors was important in an online course (Dahl, 2004; Hay et al, 2004). Sherry, Fulford, and Zhang (1998) measured perception of interaction in instructional television courses for graduate and undergraduate students. Their results indicated that learner-instructor interaction was important to distance education students. Shea et al (2001) observed similar results with undergraduate students.

A 1996 study compared graduate nursing students enrolled in instructional television to traditional format students. Results indicated that instructional television students communicate with instructors more frequently than in traditional courses. The frequent interaction contributed to a feeling of community in this study (Bischoff, Biaconer, Kooker, and Woods, 1996). However, in a 2000 study, graduate students rated their perceptions of learner-

learner and learner-instructor interaction lower than their counterparts in a traditional format course (Johnson, Aragon, Shaik, & Palma-Rivas, 2000).

Previous studies found that learner-instructor interaction contributed to student satisfaction in distance education courses. Jung (2002) indicated learner-instructor interaction and assistance were required to make distance courses satisfactory to students. Hackman and Walker (1995) investigated predictors of perceived learning and satisfaction for two-way televised students. The results indicated that students were more satisfied and perceived to learn more when instructors were "verbally and non-verbally immediate" (Walker & Hackman, 1992, p. 82). A qualitative study done by Kelsey (2000) suggested that learner-instructor interaction was important for success and face-to-face interaction with the instructor was the most enjoyable for the students. Among community college students, course satisfaction correlated with satisfaction with the instructor (Bower, Kamata, & Ritchie, 2001; Royal, Bradley, & Lineberry, 2005b).

Learner-Content Interaction

Learner-content interaction is characterized by the interaction of the learner and the subject matter. Learner-content interaction was pivotal in distance education and was the form of interaction on which all learning depends (Moore & Kearsley, 2005 Vrasidas, 2000). The earliest form of learner-content interaction was between the learner and the text (Anderson, 2003; Moore, 1989). Distance learning brought about different methods of interaction with content through the use of radio, television, and most recently, the personal computer (Anderson, 2003; Moore, 1989; Vrasidas, 2000). Because of advances in

programming, it is possible to customize and personalize learner-content interaction which can improve completion, motivation and satisfaction (Thaiupathump, Bourne, & Campbell, 1999).

Web-based instruction allowed students to interact with their content in new ways through microenvironments, virtual labs, interactive content, and computer-assisted tutorials (Anderson, 2004; Peters, 2000). These new developments in network services allowed students to take more control over their learner-content interaction. It is through learner-content interaction that the learner integrates new information into previously existing cognitive structures. The result of this type of interaction was a change in the understanding or perspective of the student with respect to the newly presented material (Moore & Kearsley, 2005; Moore 1989).

Studies on Learner-Content Interaction. A study of community college students in 1999 measured satisfaction with a televised course based on ratings of quality of instruction, ratings of overall quality of the course, and ratings of the amount learned in the course. The results indicated that for televised courses, direct learner to instructor interaction played no role in student satisfaction. Instead, it was the indirect interaction with the instructor through prepared materials that was a significant predictor of student satisfaction (Inman, Kerwin, & Mayes).

Learner-Technology Interaction. Distance students often have to interact and manage technologies that have nothing to do with the content of their course (Hillman, Willis, & Gunawardena, 1994). Proficiency was related to the level of

comfort with which the student navigates the technology (Ritchie & Newbie, 1989). The ability to interact with either the instructor or other students will depend on the ability of the student to navigate the technology successfully (Hillman, Willis, & Gunawardena, 1994). Under ideal circumstances, the interface assists with communication but does not become an independent force that directly impacts interaction and knowledge acquisition (Norman, 1990; Hillman, Willis, & Gunawardena, 1994).

Learner-technology interaction is comprised of the skills required to utilize the mediating technology successfully to allow interaction with instructors, other learners, and the content of the course. The interaction will vary based on the medium employed (England 1985). Learner-technology interaction is important because it plays a pivotal role in the students' ability to interact in their course environments and create meaning from content (Hillman, Willis, & Gunawardena, 1994; Vrasidas, 2000).

Studies on Learner-Technology Interaction. Quality of technology was found to be an important factor in interaction and satisfaction when instructional television was studied (Royal, Bradley, & Lineberry, 2005b; Thomerson & Smith, 1996). Dillon, Hengst, and Zoller suggested that the method of instruction was more important than the technology (1991). However, several studies indicated that technology posed barriers not only to communication, such as audio delays, but also posed psychological barriers for both students and instructors (Comeaux, 1995, Clow, 1999; Kelsey, 2000). Some studies indicated that students often felt self-conscious when they saw themselves on the video monitor or were fearful of

appearing silly in classes that were broadcasted to other sites (Bland et al, 1992; Comeaux, 1995; Kelsey, 2000; Sorensen, 1996; Wheeler, Batchelder, & Hampshire, 1996; Conrad, 2002). A study by Hackman and Walker indicated that instructional television was more satisfactory when the technology performs correctly (1990). A 1999 study compared student evaluations from instructional television students to those of traditional students in similar courses. That study found technology had a negative effect on the evaluations the students gave their instructors and on their perceptions of their course (Clow, 1999).

Formats of Distance Education

Different distance education instructional delivery formats will deliver the same message in different ways (Sherry, 1995). In general, distance education instructional delivery formats can be print-based, audio-based, video-based, and computer-based (Keegan, 1980). Print-based formats include distance study units and newspaper courses. Examples of audio-based courses include audio cassette and radio courses. Video cassette, television, and satellite courses are examples of video-based courses while computer-based formats include courses offered on the Internet (Keegan, 1980). Figure 2 illustrates Keegan's categorization of distance education instructional formats.

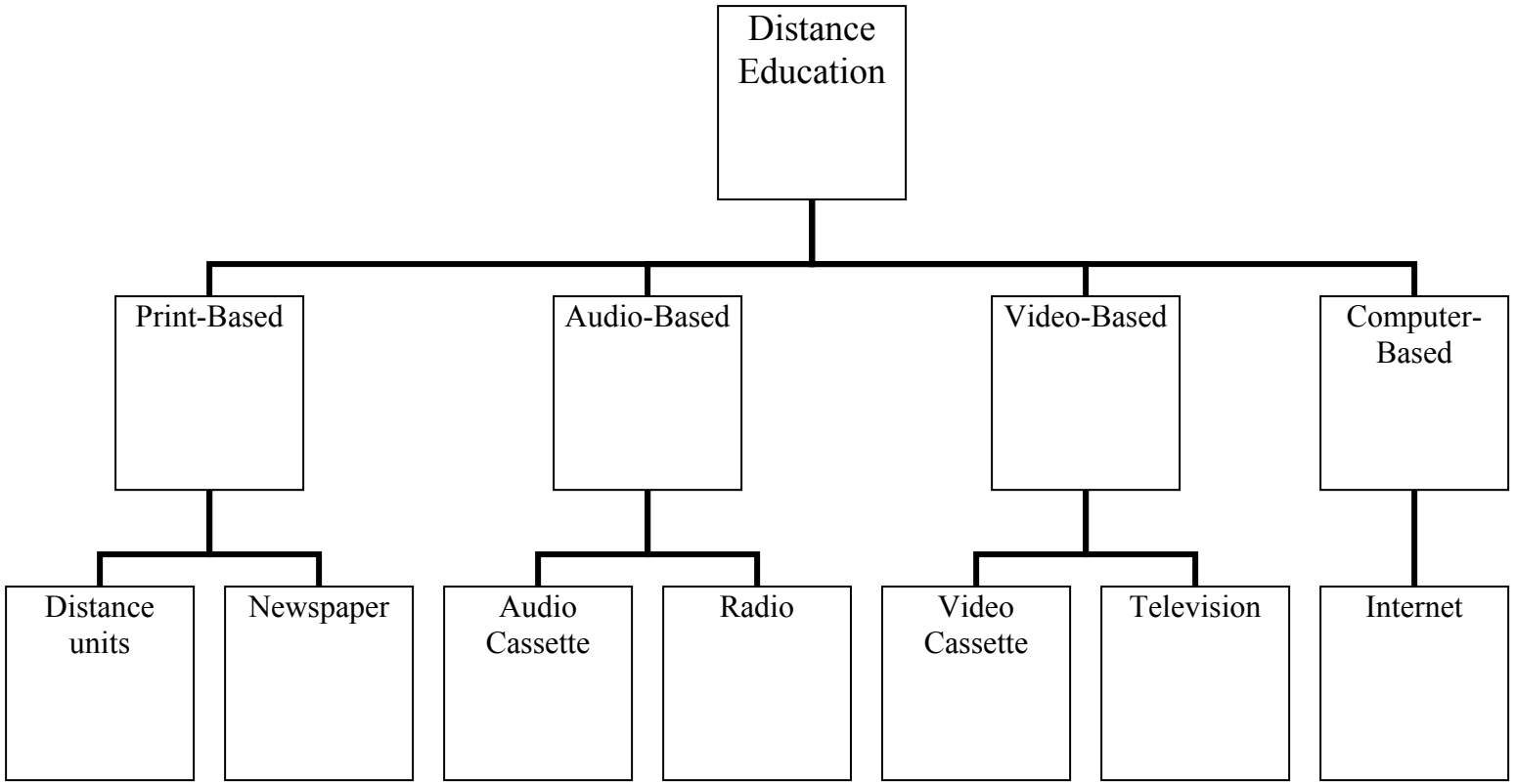
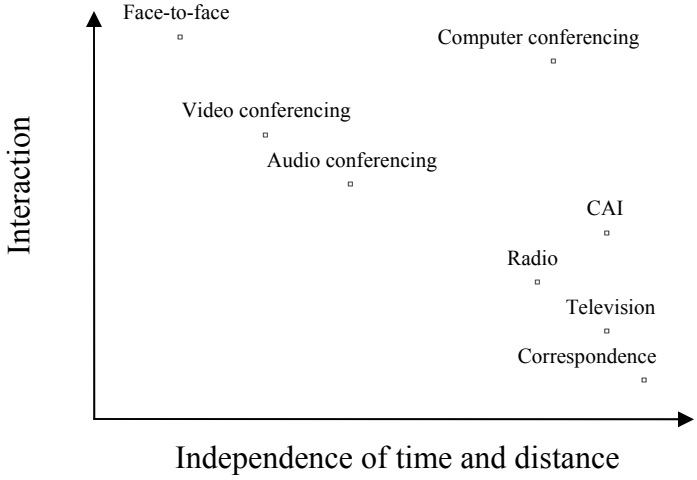


Figure 2. Formats of Distance Education*

*Keegan, 1980

Interaction capabilities vary depending on the distance education instructional delivery format employed (Anderson, 2004; Anderson, 2003; Roblyer & Wiencke, 2004). The format implemented depends in part on the cost of the technology, the availability of facilities, the interaction allowed, appropriateness to the material, number of students served, and the geographic location of the institution and the students (Parker, 1999; Potashnik & Capper, 1998). According to Anderson (2004), the more independent of time and place a course is, the less interaction is allowed. Richer forms of communication place more restrictions and less independence on time and place (Anderson, 2004). The more dialogue a format implements, the more strength it has in areas of presentation, student motivation, learner support, application and evaluation, and finally analytical and critical development for the student (Moore, 1997). Figure 3 illustrates Anderson's interactivity graph as it relates to various educational delivery formats.

Figure 3: Interactivity of Various Educational Delivery Formats*



*Anderson, 2004

Distance education instructional delivery formats that are considered low-interactivity include one-way transmission technologies such as correspondence, television, and radio (Anderson, 2004; Robler & Wiencke, 2003). Two-way transmission, such as audio conferencing, video conferencing, and computer conferencing, are considered high-interactivity mediums (Anderson, 2004; Roblyer & Wiencke, 2003).

Commonly offered distance education instructional delivery formats include one-way video, compressed video (audio and voice used in instructional television), online (Internet), and mixed mode (face-to-face and online). During the 1999-2000 academic year the Internet was the most popular tool for offering distance education in two-year public colleges. Of the students who participated in distance education courses, 55.7% used the Internet mode of delivery. Communication in real time also was possible. Thirty-nine percent of two-year

community college students enrolled in distance education took live interactive instructional delivery courses. One directional communication also was available as 43.3% of distance students made use of one-way pre-recorded video as a primary format of instructional delivery (NCES, 2000).

Course-in-a-Bag

Video-based instruction, also referred to as Course-in-a-Bag, was an early form of distance education (Miller & Honeyman, 1993; Schittek Janda et al, 2005). Many studies existed on the effect of videotaped instruction in medicine and in agriculture (Schittek Janda et al, 2005; Felton et al, 2001; Miller & Honeyman, 1994; Miller & Honeyman, 1993). This form of education provided opportunities to students who otherwise may not have had access to quality education (Secules, Herron, & Tomasello, 1992; Miller & Honeyman, 1993). Studies indicated that adding videotaped instruction to courses enhanced performance in foreign language learning, pharmacist training, and dental student preparation (Schittek Janda et al, 2005; Felton et al, 2001; Secules, Herron, & Tomasello, 1992).

While this format of distance education instructional delivery is very flexible and independent for the learner, some sacrifice of interaction between learners and between the learner and the instructor exists (Schittek Janda et al, 2005; Anderson, 2003b). Although content is presented in a nearly uniform manner to the students, each student interacts with that content, through assignments, in a different manner. As the instructor provides feedback to the

student, it is as if that instructor is entering into a personal dialogue with each student (Moore, 1989).

Studies on Course-in-a-Bag

A 2000 study by Murphy indicated that students in an environment where content was presented on videotape reported less satisfaction than students in courses on campus. Although the courses provided weekly opportunities for learner-instructor interaction, the satisfaction level was statistically lower for the videotape students (Murphy, 2000). Similarly, a 2001 study on dental students indicated that live instruction was preferred to videotape instruction of a dental procedure. In this study, dental students showed no difference in understanding the principles behind the exercise. However, when asked which method was preferred, live instruction was chosen over videotape (Packer et al, 2001).

Alternately, other studies indicated that students had good attitudes concerning videotaped instruction. For example, dental students showed satisfaction for videotaped instruction, especially when it was offered on the Internet to increase convenience and flexibility (Schittek Janda et al, 2005). Additionally, agriculture students demonstrated positive attitudes toward videotaped instruction because it provided convenience, opportunity, and control of the pace of learning (Miller & Honeyman, 1993).

Instructional Television

"Two-way interactive television uses fiber optics, co-axial cable, microwaves, or telephone lines to transmit audio and video signals to various

points, allowing a university to offer a course to multiple sites simultaneously" (Heiens & Hulse, 1995, p. 72). A study by Sherry (1995) showed that instructional television motivated and stimulated students in the learning process. Benefits of instructional television include interaction at multiple site locations, access for underserved students, the possibility to interact with experts at distant sites, and a convenience that allows students to take courses far from school yet close to home (Royal & Bradley, 2005; Miller & Honeyman, 1993; Clow, 1999; Dillon, Hengst, & Zoller, 1991; Machtmes & Asher, 2000; Wheeler, Batchelder, & Hampshire, 1996).

A 1994 study indicated that the presence of instructional television technology assisted socially apprehensive students and acted as an equalizing influence between these students and their more socially experienced counterparts with respect to persistence (Pugliese). The presence of the technology appeared to minimize instructor bias towards the more socially experienced student and gave the apprehensive student an equal chance at success (Pugliese, 1994). A major drawback to instructional television included difficulties in communication often brought about by the technology (Bower, 2000; McHenry & Bozik, 1995; Comeaux, 1995; Clow, 1999; Kelsey, 2000; Bland et al, 1992; Thomerson & Smith, 1996).

Studies on Instructional television

Several studies indicated the importance of two-way interaction in instructional television on satisfaction, attitude, and performance (Machtmes & Asher, 2000; Royal & Bradley, 2005; Ritchie & Newby, 1989). Technological

distance resulting from the instructional delivery format can reduce the amount of interaction between students and between the instructor and students (Anderson et al, 2002; Wheeler, Batchelder, & Hampshire, 1996). For example, two studies indicated that many of the instructors who used instructional television also utilized instructor-centered strategies such as lecture to transmit content to students (Dupin-Bryant, 2004; Dillon, Hengst, & Zoeller, 1991). In one study, interaction was rarely used in the televised sections with technology cited as the major barrier (Dillon, Hengst, & Zoeller, 1991). Overall, research studies showed that learner-centered approaches in instructional television reduced social and psychological distance and left the learner more satisfied (Dupin-Bryant, 2004).

Instructional television students can experience their classes in one of two environments. The host-site student takes class at the institution usually with the instructor present. The remote site student observes and participates in classes from a site away from campus usually without the instructor present. A literature review by Royal and Bradley indicated that studies suggested both host and remote site students were satisfied, although it may be for different reasons (Royal & Bradley, 2005; Thomerson & Smith, 1996).

A pilot study done on community college students indicated that student personality seemed to play a more significant role in satisfaction for remote students than for students at the host site. Specifically, remote students who were concrete thinkers, emotionally stable, self-assured, and conscientious were more satisfied with their instructional television experience (Bower, Kamata, & Smith, 2001).

Conversely, some studies indicated that remote site students were less satisfied with instructional television than host site students (Bower, 2000; Sorensen, 1996; Clow, 1999). Other studies suggested the opposite was true as host site students had to endure technical issues that they felt brought them fewer benefits than the remote site students (Thomerson & Smith, 1996; Wheeler, Batchelder, & Hampshire, 1996). Literature suggested that remote site students were also more patient with technological glitches because they felt the benefits of the convenience outweighed the technological drawbacks (Thomerson & Smith, 1996; Wheeler, Batchelder, & Hampshire, 1996).

A study by Clow examined satisfaction based on a traditional end-of-year survey that purposely made no mention of satisfaction. The results revealed that host site students were more satisfied than remote site students leading Clow to conclude that remote site students included bias in their responses because they required the access instructional television offered (Clow, 1999).

The instructional television format of instructional delivery provides opportunity for two-way audio and video interaction for distance education students. Overall, interaction through learner-centered strategies and learner-instructor interaction leave students feeling more satisfied. However, instructional television technological issues can be both a communication and psychological barrier that impacts satisfaction of distance education students.

Online

Online learning has been called a "breakthrough in teaching and learning" because it provides high exchange of information and expertise while it extends the reach of higher education to a number of types of learners (Picciano, 2006; Johnson, Aragon, Shalik, & Palma-Rivas, 2000; Eastman & Swift, 2001; Hailey, Grant-Davie, & Hult, 2001). Because of these features, online learning is a dominant distance education instructional delivery format among other distance education formats (Howell, Williams, & Lindsay, 2003). According to Rowntree (1995), "the communication is many-to-many" where information flows not only from instructor to student but between students as well (p. 206).

Positive aspects of the online format include the increased interaction and collaboration, increased amount of available material, reflective nature of asynchronous communication, and convenience and flexibility of schedule (Anderson, 2004; Brower, 2003; Lee & Gibson, 2003; Clark, 2001; Poole, 2000; Sringam & Geer, 2000; Swan, 2001; Garrison, Anderson, & Archer, 2000; Rovai, 2002c; Rowntree, 1995; Meyer, 2003). In general, the online environment has made students feel more at ease with presenting their ideas to the group resulting in more egalitarian interaction (Tullar, Kaiser, &Balthazard, 1998; Clark, 2001; Brower, 2003; Lee & Gibson, 2003; Poole, 2000). Overall, this distance education instructional delivery format offers the most opportunity for interaction out of all distance education instructional delivery formats (Anderson, 2004).

Online distance education courses are often criticized as a form of instructional delivery in the literature. Critics cite the lack of interaction resulting

in the potential isolation of students, the problems and complexity associated with the technology, knowledge required for participation, the passive format, lack of visual cues, potential technological intimidation, and loss of richness of communication as potential faults of online instruction (Brower, 2003; Johnson, Aragon, Shalik, & Palma-Rivas, 2000; Clark, 2001; Hailey, Grant-Davie, & Hult, 2001; Hay et al, 2004).

Studies on Online Courses

Interaction in online courses changes the shape of learning and has the potential to positively affect quality and satisfaction (Swan, 2001; Shea et al 2001; Beuchot & Bullen, 2005). Computer-mediated technologies "support collaboration, discursive interaction and the building of relationships" that can help improve interaction and learning outcomes such as satisfaction (Sringam & Geer, 2000).

Hay indicated that online students expected to interact with the instructor and fellow peers in the online environment and failure to provide opportunities for this interaction may impact effectiveness and learning (Hay et al, 2004). Christianson, Tiene, & Luft (2002) examined instructor perceptions of online instruction and found that 57% of the instructors felt that the online format increased interactivity between students and 70% felt that interactivity between student and instructor was increased. Additionally, many studies suggested that all levels of students were more interested, learned at a higher level or at least the same level, and retained more information while taking online courses (Brower, 2003; Eastman & Swift, 2001; Shea et al, 2001; Warren & Holloman, 2005). Lee

and Gibson (2003) suggested that online graduate students use interaction to help them take control and responsibility for their learning where structure permits. The reflective nature of the medium improved the quality of participation for both the student and the instructor as compared to the spontaneous participation that occurs in face-to-face, traditional mediums.

The literature indicated that satisfaction was influenced by the online format of instructional delivery (Aragon, Shaik, & Palma-Rivas, 2000; Bower, 2000; Brower, 2003; Meyer, 2003; Warren & Holloman, 2005). A study of undergraduates indicated that students are generally satisfied with the asynchronous format of online courses (Jung et al, 2002; Swan, 2000; Shea et al, 2001). Studies by both Shea, et al (2001), and Swan (2000) indicated that learner-instructor interaction is critical to satisfaction in online instruction. In contrast, a study by Jung indicated that students in courses that encouraged learner-learner interaction were more satisfied with their learning process while students in courses that encouraged social interaction (feedback or encouragement) between learner-instructor performed better than strictly academic or collaborative (learner-learner) groups (2002). Overwhelmingly, the literature suggested a relationship between satisfaction and "shared discourse" both between students and between students and instructors in online courses (Swan, 2001, p. 326).

Conversely, a study by Maki and Maki (2003) indicated that students in web-based courses learned more but were less satisfied. Johnson et al (2000) compared online graduate students to face-to-face students in the same course. No significant differences were observed in learning outcomes but face-to-face

students reported significantly higher perceptions of interaction and satisfaction (Johnson, Aragon, Shaik, and Palma-Rivas, 2000).

Extensive learner-learner and learner-instructor interaction in online instructional delivery courses resulted in the creation of online learning communities (Brower, 2003; Rovai, 2002b; Conrad, 2002; Brown, 2001). A 2002 study by Rovai indicated that online courses created community as well as traditional face-to-face courses (Rovai, 2002c). Palloff and Pratt (1999) suggested, "In the online classroom, it is the relationships and interactions among people through which knowledge is primarily generated" (p. 15). Online learning communities benefit distance learners by supporting knowledge acquisition and application, preventing isolation, providing interaction with students and instructors and providing satisfaction (Brower, 2003; Brown, 2001; Dahl, 2004; Lee & Gibson, 2003; Palloff & Pratt, 1999; Rovai, 2000b). A possible downside of instruction in a learning community was the restriction of freedom that often accompanied distance education (Anderson, 2004).

Mixed Mode

Mixed mode, sometimes called blended learning, attempts to combine the best features of the traditional classroom with the online classroom to maximize the advantages and minimize the disadvantages of both (Osguthorpe & Graham, 2003;Wonacott, 2002). Benefits that the face-to-face meetings contribute to this format of instruction include the return of the spontaneity and human contact that is lost in strictly online formats (Osguthorpe & Graham, 2003). Online

instructional delivery advantages include the flexibility of interaction and the open dialogue that is allowed as well as higher levels of learning, knowledge construction and reflection (Bonk & Kim, 2004;Garrison & Kanuka, 2004; Osguthorpe & Graham, 2003; Wonacott, 2002). Drawbacks included students not taking full advantage of the online component because the face-to-face component was available (Angeli, Valanides & Bonk, 2003; Vrasidas & McIsaac, 1999.)

Institutions offer mixed mode instruction to better meet the needs of the learners and potentially reduce dropouts (Picciano, 2006; Kerres & DeWitt, 2003; Singh, 2003). Additionally, mixed mode instructional delivery formats can be used as a way to ease a traditional format into the online learning environment (Kerres & DeWitt, 2003). Mixed mode can best be described as the "thoughtful integration of classroom face-to-face learning experiences with online learning experiences (Garrison & Kanuka, 2004p. 96). A formal definition developed at the 2005 Sloan-C Workshop on Blended Learning stressed the integration of online and face-to-face activities "in a planned, pedagogically valuable manner" as well as the replacement of some face-to-face time by online activities (Picciano, 2006, p. 3).

The exact quantity of online and face-to-face interaction required to qualify as mixed mode is unknown, and many options are available (Picciano, 2006; Bonk & Kim, 2004; Osguthorpe & Graham, 2003). However, mixed mode is more than simply adding a bit of online chatting to a class. The amount of face-to-face and online interaction allowed should be based upon the instructional

goals, student characteristics, instructor background, and online resources with the goal being to improve student learning (Kerres & DeWitt, 2003; Osguthorpe & Graham, 2003). Garrison and Kanuka suggested mixed mode is the "reconceptualization of the teaching and learning dynamic" that integrates online and face-to-face instead of layering them on top of each other (2004, p. 97). Goals that educators may address as they implement a mixed method instructional delivery format include pedagogical richness, access to knowledge, social interaction, learner control of structure, cost effectiveness, and ease of revision (Osguthorpe & Graham, 2003).

Studies on Mixed Mode Courses

Previous studies suggested that single instructional delivery formats of instruction can be limiting while mixed instructional delivery formats offered a richer experience with more effective and satisfying learning (Kerres & DeWitt, 2003; Singh, 2003). A study by Irons et al (2002) indicated that the addition of an online component to a traditional face-to-face study resulted in an increase in satisfaction, perceived learning, and learner-instructor interaction.

Vrasidas & McIsaac (1999) identified several factors that influenced interaction in mixed mode courses. For example, factors such as class size, prior technology experience, feedback, and workload all influenced interaction in mixed mode courses. Twigg (2003) presented other results from 30 institutions' redesigned courses to the mixed mode instructional delivery format. Positive results observed after the integration of an online component included improved

student learning and satisfaction, improved retention, and reduced costs of delivery when compared to traditional format courses.

Establishment of a learning community also is possible through mixed mode formats to facilitate knowledge construction (Garrison & Kanuka, 2004). Specifically, the online component is useful for providing the opportunity for flexible interaction, collaboration, and knowledge building (Bonk & Kim, 2004; Wonacott, 2002). It is expected that the role of the instructor will be altered within this learning community. Roles such as mentor, coach, and counselor will become more important as mixed mode instruction opens up greater opportunity for students (Bonk & Kim, 2004).

The literature shows great promise for mixed mode learning in higher education. According to Bonk & Kim (2004), "blended learning will foster increased connectedness, collaboration, and global awareness" (p.13). The mixed mode distance education instructional delivery format is frequently in use in higher education and is expected to increase (Bonk & Kim, 2004). The mixed mode instructional delivery format can preserve and improve the best of traditional higher education while offering innovation through technology (Garrison & Kanuka, 2004).

Summary of the Literature Review

Distance education has a long history in education and has evolved with advancements in technology. This chapter presented general information on distance education including definitions of distance education, historical

background information, formats of distance education instructional delivery, and a theoretical construct to support the study. Additional information was provided on distance education students, types of interaction in distance education, and results of literature findings.

Since distance education is a popular and convenient form of education for students, institutions are offering various forms of distance courses with increasing frequency. Good technology choices can determine the success or failure of a distance education course (Potashnik & Capper, 1998). However, good technology often equates to increased expense for an institution and new technology is often "bolted" onto existing technology or physical facility (Twigg, 2003, p. 24). While many studies compared distance courses to traditional, face-to-face courses, few were done that compared various distance education instructional formats to each other with respect to interaction and satisfaction.

Satisfaction as a learning outcome is important because it influences retention, referral, motivation, commitment to the program, and finally success (Biner, Dean, & Mellinger, 1994; Pascarella et al, 1996). Reviews of recent studies on the theory of transactional distance indicated a lack of studies on the theory as it pertains to learning outcomes (Gorsky & Caspi, 2005). As a result, this study uses Moore's (1997) existing theory on distance education to support the conceptual framework for the study. Previous research on this theory supports the relationship between interaction, transactional distance, and satisfaction in various formats of distance education instructional deliveries for courses.

This study investigated the effect of four different distance education instructional delivery formats on students' perception of four types of interaction and satisfaction. The measurement of interaction in this study represented a measurement of dialogue. According to recent studies, it is possible to manipulate the format of distance education instructional delivery to influence the level of interaction which can influence both transactional distance and satisfaction (Saba & Shearer, 1994; Chen & Willits, 1998). The findings from this study may help administrators choose a format of instructional delivery that best suits their institutions, their students, and their budget.

CHAPTER III

METHODOLOGY

This chapter begins by linking the theoretical framework to the research design. A description of the research design, research hypotheses, research variables, instrumentation, data collection procedures, and data analysis used in the study are also included in the chapter. The chapter concludes with an overall summary of the research methods used for the study.

Moore's Theory of Transactional Distance

Moore's *Theory of Transactional Distance* was used to address the problem in this study and guide the development of the three research questions. Lack of interaction that is often associated with distance education and the potential negative consequences such as lack of student motivation and increased attrition have served as stumbling blocks to the widespread acceptance of distance education in higher education. Satisfaction is an important learning outcome to quantify because it influences retention, referral, motivation, commitment and success (Biner, Dean, & Mellinger, 1994; Pascarella et al, 1996). This study proposed to add to the body of knowledge concerning interaction, transactional distance and student satisfaction in distance education using Moore's theory as a guide.

According to Moore (1997), it is possible to manipulate the medium of communication to increase dialogue and decrease transactional distance.

Programs that allow more interactive communication are more likely to reduce transactional distance (Moore, 1997). Using Moore's theory and previous studies on transactional distance, this study examined four methods of instruction with theoretically different interaction capabilities and quantified four types of interaction based upon Moore's definition of interaction (Moore, 1989). Assuming, based upon Moore's theory, that increasing interaction decreases transactional distance, this study also examined the relationship between interaction, transactional distance, and satisfaction, an important learning outcome in higher education.

Research Design

The major purpose of this study was to examine the effect of format of distance education instructional delivery on interaction and satisfaction at a two-year community college in the Southeastern United States. The quantitative survey research design methodology was used to collect data for this study. The site of the study was a two-year, public community college located in the Southeastern United States. The following research questions guided the study:

1. How do students enrolled in four formats of distance education instructional delivery perceive interaction and satisfaction?
2. Do perceptions of interaction and satisfaction differ among students enrolled in four formats of distance education instructional delivery?

3. Do significant relationships exist between the perceptions of interaction and satisfaction among the students enrolled in four formats of distance education instructional delivery?

Survey research design methodology is an appropriate method because surveys allow the evaluation of the effectiveness of programs (Fink, 2006). In addition, survey methods provide "a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population" (Creswell, 2003, p153). According to Kerlinger and Lee (2000), survey methods are useful because they allow researchers to draw inferences about whole populations while studying a smaller sample. Additionally, the research survey method was selected for this study because of the following reasons:

1. The researcher did not have access to the entire community college distance education student population.
2. The research required the individual perceptions of the distance education students.
3. There are few quantitative studies on student satisfaction as an indicator of quality for the population of interest.

Sherry, Fulford, and Zhang (1998) indicated the appropriateness of using a survey to measure interaction in distance education. Their study explored interaction with students enrolled in an instructional television course. A survey was used to quantify interaction based on Moore's framework of interaction in distance education. Reliability and validity was reinforced through exploratory factor analysis and Cronbach Alpha values.

Research Hypotheses

The second and third research questions were addressed by investigating their corresponding null hypotheses. Since research question 1 was strictly used to collect demographic data on the sample, no research hypothesis was generated. The following includes the six null hypotheses used in the study to explore research question 2.

Research Question 2

Do perceptions of interaction and satisfaction differ among students enrolled in four formats of distance education instructional delivery?

H_{01}: No difference exists in student perception of learner-learner interaction among students enrolled in four formats of distance education instructional delivery.

H_{02}: No difference exists in student perception of learner-instructor interaction among students enrolled in four formats of distance education instructional delivery.

H_{03}: No difference exists in student perception of learner-content interaction among students enrolled in four formats of distance education instructional delivery.

H_{04}: No difference exists in student perception of learner-technology interaction among students enrolled in four formats of distance education instructional delivery.

H_{05}: No difference exists in student perception of overall interaction among students enrolled in four formats of distance education instructional delivery.

H_{O6}: No difference exists in student perception of satisfaction among students enrolled in four formats of distance education instructional delivery.

The following includes the four null hypotheses used in the study to explore research question 3.

Research Question 3

Do significant relationships exist between the perceptions of interaction and satisfaction of the students enrolled in four formats of distance education instructional delivery?

H_{07}: No relationship exists between learner-learner interaction and satisfaction among students enrolled in four formats of distance education instructional delivery.

H_{08}: No relationship exists between learner-instructor interaction and satisfaction among students enrolled in four formats of distance education instructional delivery.

H_{09}: No relationship exists between learner-content interaction and satisfaction among students enrolled in four formats of distance education instructional delivery.

H_{010}: No relationship exists between learner-technology interaction and satisfaction among students enrolled in four formats of distance education instructional delivery.

The Institution

The educational institution used as the site of this study has an enrollment of 12,000 credit-seeking students per semester on three campuses in the area. Students have the opportunity to earn college transfer associate degrees and technical associate degrees, diplomas and certificates. Academic programs include Allied Health Sciences; Business Technology; Community, Family and Child Studies; Culinary Institute of Charleston; Film, Media and Visual Arts; Humanities and Social Sciences; Industrial and Engineering Technology; Law-Related Studies; Nursing; and Science and Mathematics. Developmental education and comprehensive student services are provided to all types of entering students. The participants in this study were students taking part in distance education courses delivered by Course-in-a-Bag, instructional television, online, and mixed mode instructional delivery formats in the Fall semester of 2006.

Participants

In order to measure the variables of interaction and satisfaction, a cross sectional, convenience sample of students enrolled in all four formats of distance education at the institution of interest were surveyed. All students participating in

distance education offered via four formats of instructional delivery at the institution in the Fall 2006 semester were invited to participate in the *Interaction and Satisfaction Survey* through their campus e-mail system, Campus Cruiser. A copy of the invitation to participate is shown in Appendix A. Surveys were made available to 5536 distance students.

Conceptual Framework

Research variables. The research variables for the study were identified based on each of the three research questions. For research question 1, this study proposed to quantify the four types of interaction and satisfaction across the four formats of distance educational instructional delivery for the various demographic variables at a two-year community college. Table 1 provides a list of the dependent and independent variables for this research question.

The dependent variables were the four types of interaction and satisfaction. Interaction was quantified in four areas including learner-learner, learner-instructor, learner-content, and learner-technology. The independent variables were the demographic variables (gender, age, and ethnicity) and the formats of distance education instructional delivery. Distance education at the participating institution of interest was offered in four different formats. These four formats of instructional delivery included Course-in-a-Bag, instructional television, online, and mixed mode. Course-in-a-Bag was a one-way asynchronous video, audio, CD or DVD transmission of content material. Instructional television courses were delivered through compressed video and

broadband systems to the campuses in the institution's system and include two-way audio and video. Online courses were taught through the Internet and encouraged both synchronous and asynchronous interaction. Mixed mode courses combined asynchronous delivery of content material with face-to-face meetings. Descriptive statistics including frequencies and percentages were used to analyze the data for research question 1.

Table 1. Dependent and Independent Variables for Research Question 1

	Variables
Dependent variables	Interaction Variables
	Learner-Learner Interaction
	Learner-Instructor Interaction
	Learner-Content Interaction
	Learner-Technology Interaction
	Satisfaction Variable
	Student satisfaction
Independent variables	Demographic Variables
	Age
	Gender
	Ethnicity
	Format Variables
	Course in a Bag delivery
	Instructional Television delivery
	Online delivery
	Mixed mode delivery

The second research question addressed differences in student perceptions of interaction and satisfaction among students enrolled in four formats of distance education instructional delivery. Table 2 provides a list of the dependent and independent variables for research question two.

Table 2. Dependent and Independent Variables for Research Question 2

	Variables
Dependent variables	Interaction Variables
	Learner-Learner interaction
	Learner-Instructor interaction
	Learner-Content interaction
	Learner-Technology interaction
	Satisfaction Variable
	Student satisfaction
Independent variables	Format Variables
	Course in a Bag delivery
	Instructional Television delivery
	Online delivery
	Mixed mode delivery

The dependent variables were the four types of interaction and student satisfaction. The independent variables were the formats of distance education

instructional delivery. Analysis of Variance (ANOVA) was used to compare the means of the dependent variables.

The third research question addressed relationships between the four types of interaction and satisfaction for the various formats of distance education instructional delivery. Table 3 provides a list of the dependent and independent variables for research question 3. The dependent variables included the four types of interaction and student satisfaction. The independent variables included the formats of distance education instructional delivery. Pearson Product Moment correlations were calculated between the dependent variables interaction and satisfaction for each format of distance education instructional delivery.

Table 3. Dependent and Independent Variables for Research Question 3

	Variables
Dependent variable	Interaction Variables
	Learner-Learner interaction
	Learner-Instructor interaction
	Learner-Content interaction
	Learner-Technology interaction
	Satisfaction Variable
	Student satisfaction
Independent variables	Format Variables
	Course in a Bag delivery
	Instructional Television delivery
	Online delivery
	Mixed mode delivery

Instrumentation

In order to measure the effect of four formats of distance education instructional delivery on student perceptions of interaction and satisfaction, an *Interaction and Satisfaction Survey* was used to collect the data (Appendix B). As previously stated, surveys are an appropriate method because they allow the evaluation of the effectiveness of programs that bring about change (Fink, 2006). The survey measured students' perceptions of interaction and satisfaction in each

of the four distance education instructional delivery formats. Interactions were measured between learners, between the learner and the instructor, between the learner and the content, and finally between the learner and the technology.

The *Interaction and Satisfaction Survey* was constructed based on a number of existing surveys from the literature. The interaction portion of the survey was developed based upon an interaction rubric proposed by Roblyer and Ekhaml in 2000. The variables of interaction were quantified using questions that addressed the areas of learner-learner interaction, learner-instructor interaction, learner-content interaction, and learner-technology interaction. The satisfaction portion of the survey was developed using a survey based upon the *Telecourse Evaluation Questionnaire* developed by Paul Biner in 1994, the *Clemson University Instructor Assessment*, and *Noel-Levitz's Student Satisfaction Inventory: Community, Junior and Technical College Version* (Shreiner & Juillerat, 1994). Related to satisfaction, the *Interaction and Satisfaction Survey* addressed issues such as satisfaction with the instructor/instruction, technology, course management, promptness of delivery of material, support services, and out-of-class communication with the instructor.

A panel of experts reviewed the survey to determine content validity. Kerlinger and Lee (2000) suggested that content validation is important to ensure the instrument is measuring the desired constructs adequately. After revisions were made as suggested by the panel of experts, a pilot study was conducted during the Summer 2006 session.

The initial survey instrument consisted of a 35-item questionnaire using a four-point Likert scale that ranged from 1 (*never)*, 2 (*rarely)*, 3 (sometimes) to 4 (*frequently*). Literature supports the sufficiency of a four-point Likert scale for surveys (Jacoby, 1971).

Pilot study. A pilot study using the initial instrument was distributed to 1572 students enrolled in distance education courses during Summer Session 2006. An overall response rate of 23.2% was achieved with 366 pilot surveys returned. The purpose of the pilot study was to establish content validity and improve the questions, format of the instrument, and scales (Creswell, 2003; Fink, 2006; Kerlinger & Lee, 2000). Additionally, the pilot was conducted to make sure the researcher received the appropriate data responses in order to address the research questions (Fink, 2006). After analysis of the pilot data, question 16 was removed during the final revision at the request of one of the expert panelists. Item 16 stated "I receive my course materials by fax," and was removed because fax was no longer a current method used to distribute content to distance students at the institution. Additionally, the final version of the *Interaction and Satisfaction Survey* included four items inadvertently excluded from the satisfaction section of the pilot survey. The items addressed satisfaction with the course and the instructor and were concluded by the panel of experts to be of importance for the final version of the survey. Reliability and validity of the instrument were supported through the pilot study.

Final survey. In order to reinforce reliability of the final instrument, the Cronbach Alpha coefficient was calculated. Cronbach Alpha is a measure of internal consistency calculated based on the average inter-item correlation for groups of questions that are theoretically related (Kerlinger & Lee, 2000). Table 4 shows the Cronbach Alpha values for the groups of questions on the survey that were theoretically related.

Table 4. Alpha Cronbach Values for Survey Questions

Theoretical Category	Question Items	Alpha Cronbach Value	Mean	SD
Learner-Learner Interaction	1-8	0.899	2.657	.961
Learner-Instructor Interaction	9-15	0.875	3.512	0.701
Learner-Content Interaction	16-22	0.642	2.233	0.916
Learner-Technology Interaction	23-27	0.690	1.906	0.891
Satisfaction	28-35	0.937	3.549	0.721

The first eight items on the *Interaction and Satisfaction Survey* theoretically measured students' perceptions of learner-learner interaction. The Cronbach's alpha for this group of eight questions was 0.899. Learner-instructor interaction was addressed in questions 9-15 with a Cronbach Alpha score of 0.875. Questions 16 through 22 were written to theoretically measure students' perceptions of learner-content interaction and had a Cronbach Alpha score of 0.642. Learner-technology interaction was theoretically quantified using

questions 23-27 and had a Cronbach Alpha score of 0.690. Finally, questions 28 through 35 theoretically measured satisfaction with a Cronbach Alpha score of 0.937. Sproull (1988) indicated that a typical reliability coefficient for a researcher-designed instrument is approximately 0.70 or higher. Kerlinger and Lee (2000) stressed that the acceptability of the reliability value depended on the types of decisions made using the instrument. Since this study was an early stage study, the reported reliability values for the groups of questions were determined to be acceptable.

In addition to the use of Cronbach Alphas, an exploratory factor analysis was conducted on the final survey in order to further reinforce that the theoretical grouping of questions was appropriate. Factors were extracted with Eigen values over 1.0 as proposed by Kaiser (1960). Using a combination of Eigen values and the results of a scree plot, a five-factor solution was retained. The five factors accounted for 54.2% of the total variance.

The first factor contained questions 28 through 34 from the *Interaction and Satisfaction Survey* which theoretically quantified student satisfaction. The second factor contained questions 9 through 15 from the *Interaction and Satisfaction Survey,* which theoretically measured the area of learner-instructor interaction. Factor three loaded questions one through five and eight from the survey, which theoretically measured the area of learner-learner interaction. Factor four loaded questions 24-26 from the survey, which theoretically quantified learner-technology interaction. Finally, the fifth factor contained questions 16 and 19-21 from the survey, which theoretically measured learner-

content interaction. The factor analysis results further reinforced the theoretical grouping of the survey items.

The final version of the *Interaction and Satisfaction Survey* is shown in Appendix B. Table 5 shows the items and content descriptions included in the final version of the survey. The survey contained seven demographic items and 38 interaction and satisfaction items. The demographic items included questions on age, gender, ethnicity, status, program, county of residence, and previous experience with distance education. The final version of the *Interaction and Satisfaction Survey* was administered to all distance education students at the community college of interest. The research design and instrument were examined and approved by the Dean of Distance Learning at the two-year institution as well as Clemson University's Institutional Review Board to assure the protection of all participants (Appendix C).

Table 5. Content Description of *Interaction and Satisfaction Survey* Items

Items	Content Description
Demographic Data	Gender, Age, and Ethnicity
1-8	Learner-Learner Interaction
9-15	Learner-Instructor Interaction
16-21	Learner-Content Interaction
22-26	Learner-Technology Interaction
27-38	Satisfaction

Data Collection

Data were collected using the final version of the *Interaction and Satisfaction Survey*. Participants were selected using convenience sampling at a two-year institution in the Southeastern United States. An invitation to take the *Interaction and Satisfaction Survey* was e-mailed to every student enrolled in courses offered in the four formats of distance education instructional delivery at the institution of interest (Appendix A). A total of 5536 invitations were distributed through the institution's online survey distribution system INQUISITE on September 11, 2006. In order to collect the best data from student participants, surveys for the study were available for 13 days between the dates of September 11 through September 24, 2006. This timing allowed students three weeks experience with their courses before they were invited to take the survey. This three-week period was important to allow students time to become comfortable with the technology and instructional formats of their distance courses (Anderson, 2003; Brown, 2001; Garrison & Cleveland-Innes, 2005; Rowntree, 1995). The two-week surveying period allowed for initial distribution and follow-up for non-completers.

An overall response rate of 18.5% was achieved with 1,024 surveys returned. Table 6 shows mixed mode students returned the most surveys with a 50% return rate followed by Course-in-a-Bag students with 24.6%. Online students returned 18.2% and instructional television students returned 4% of the surveys. According to Fink (2006), if the instrument is relatively simple, then the researcher has to determine how many responses make the results believable.

Since 1,024 responses that represented all four formats of instructional delivery were received, the response rate was determined to be acceptable.

Table 6: Survey Response Rates for Four Formats of Distance Education Instructional Delivery at a Two-Year College

Format of Instruction	Total Enrolled	Responded	Percentage (%)
Mixed Mode	159	80	50.3%
Course-in-a-Bag	462	114	24.7%
Online	4461	812	18.2%
Instructional Television	454	18	4%

Data Analysis

The statistical package SPSS 14.0 was used for all data analysis in this study. Data were received from the institution of interest as an Excel file in a comma separated variable (CSV) format. The Excel data were uploaded into SPSS version 14.0 for data analysis.

In order to address the first research question, descriptive statistics were calculated for the four types of interaction and satisfaction across the four formats of distance education instructional delivery for the demographic variables of age, gender, and ethnicity. Means and standard deviations were reported.

To address the second research question, the means and standard deviations of the interaction and satisfaction scores were computed for each format of distance education instructional delivery. Analysis of Variance was utilized to determine if statistically significant differences existed in each type of

interaction across each format of instructional delivery, between student satisfaction across each format of instructional delivery, and in overall interaction across each format of instructional delivery. Reported values included the sum of squares between groups and within groups, degrees of freedom, mean square, F-value, and p-value (Morgan, Reichert, & Harrison, 2002). Analysis of Variance was chosen as the approach because it can efficiently determine statistically significant differences thereby establishing a relationship between more than two groups (Kerlinger & Lee, 2000). The level of significance was set at p=0.5. In social science research erroneously accepting the null hypothesis 5% of the time is both acceptable and reasonable (Kerlinger & Lee, 2000).

To address the third research question, Pearson Product-Moment Correlations were used to determine the direction and strength of the relationships between the variables of interaction and satisfaction (Kerlinger & Lee, 2000). Correlation values range from -1 to 1. A correlation of 1 indicates a perfect correlation in the positive direction. A correlation of -1 indicates a perfect correlation in the negative direction. A correlation of zero indicates no relationship between the paired variables of interest (Ottman & Longnecker, 2001). Values reported in the study included the coefficient of determination (r), degrees of freedom (df), level of significance (p), mean (M), and standard deviation (SD) (Morgan, Reichert, and Harrison, 2002). Correlations were calculated between the interaction score for each format of distance education instructional delivery and the satisfaction score for that same format of instruction.

Summary

The research methodology was designed to quantify the perceptions of four types of interaction (learner-learner, learner-instructor, learner-content, and learner-technology) and satisfaction for four formats of distance education instructional delivery (Course-in-a-Bag, instructional television, online, and mixed mode) of courses at a two-year community college. In order to address the effects of format of distance education instructional delivery on student perceptions of interaction and satisfaction, the following steps were followed in completing the study:

1. The survey questionnaire was developed.
2. The sample population was selected.
3. The survey questionnaire was pilot tested, analyzed, and revised. Validity and reliability were checked using Cronbach's alpha and factor analysis.
4. The *Interaction and Satisfaction Survey* questionnaire was sent via e-mail to all distance education students at the institution of interest.
5. Reminders were sent after the first week of survey availability.
6. Survey data were received in an anonymous CSV file, uploaded and entered into a SPSS file for 1024 cases.
7. The collected data were analyzed using SPSS 14.0 to generate descriptive statistics, ANOVA, and Pearson Product-Moment correlation coefficients.

8. The data were interpreted as they related to the research questions, research hypotheses, and the current literature on the topic.

CHAPTER IV

ANALYSIS OF THE DATA

The purpose of this chapter is to present the data collected regarding perceptions of interaction and satisfaction in four formats of distance education instructional delivery at a Southeastern two-year community college. The first section of the chapter includes a presentation of the findings and analysis of the survey data that addressed the first research question of the study. The second section presents the findings and analysis of the survey data related to the second research question and six null hypotheses statements. Section three contains the findings and analysis of the survey data that addressed the third research question and four null hypotheses statements of the study. Finally, the fourth section provides a summary of the results.

Data were collected by means of the *Interaction and Satisfaction Survey* as described in Chapter III. The survey included 38 items that were organized into five categories. The scale of responses ranged from 1 *(never)*, 2 *(rarely)*, 3 *(sometimes)*, to 4 *(frequently)*. The categories included items that addressed perceived learner-learner interaction, learner-instructor interaction, learner-content interaction, learner-technology interaction, and student satisfaction. Responses were received from 1,024 distance education students enrolled in courses offered in four formats of distance education instructional delivery. Descriptive statistics were calculated using the responses from the demographic items from the surveys returned by the distance education students. Analysis of

variance (ANOVA) was conducted to determine the differences in interaction and satisfaction across the four formats of distance education instructional delivery. Additionally, Pearson Product-Moment correlation coefficients were formulated to determine the relationships between the four types of interaction and satisfaction for the four formats of instructional delivery. The three research questions and ten hypotheses statements guided the data analysis.

Research Question 1

The following section presents the findings and analysis of the data for research question 1.

Research Question 1

How do students enrolled in four formats of distance education instructional delivery perceive interaction and satisfaction?

Findings

The means of the four types of perceived interaction and satisfaction in the four formats of distance education instructional delivery are shown in Table 7. Learner-learner interaction was quantified by calculating the mean of questions 1-8 for all survey participants. Learner-instructor interaction was quantified by calculating the mean of questions 9-15 for all survey participants. Learner-content interaction was quantified by calculating the mean of questions 16-22 for all survey participants. Finally, learner-technology interaction was quantified by calculating the mean of questions 23-27 for all survey participants.

Data indicated that students reported highest learner-learner, learner-instructor and learner-technology interaction means in the mixed mode format of instructional delivery. The means for learner-content interaction were highest in mixed mode as well but only by a fraction compared to Course-in-a-Bag. Student reported the highest mean satisfaction in the online format of instructional delivery.

Table 7. Means of Interaction and Satisfaction for Each Format of Distance Education Instructional Delivery

	Learner-Learner Interaction		Learner-Instructor Interaction		Learner-Content Interaction		Learner-Technology Interaction		Satisfaction	
	M	N	M	N	M	N	M	N	M	N
Course-in-a-Bag	1.78	114	3.17	114	2.50	114	1.72	114	3.41	116
Instructional Television	2.47	18	3.07	18	2.29	18	1.63	18	3.29	18
Online	2.74	812	3.56	812	2.17	812	1.92	812	3.58	812
Mixed Mode	3.11	80	3.60	80	2.51	80	2.14	80	3.52	80

The means of overall interaction in the four formats of instructional delivery are shown in Table 8. When the questions that quantified all four types of interaction were combined to determine an overall interaction mean, most students reported the highest overall interaction mean in the mixed mode format of instruction.

Table 8. Means of Overall Interaction for Each Format of Distance Education Instructional Delivery

Format	Overall Interaction	
	M	N
Course-in-a-Bag	2.31	114
Instructional Television	2.43	18
Online	2.67	812
Mixed Mode	2.92	80

The data collected from the *Interaction and Satisfaction Survey* also included information on the participant's gender, age, and ethnicity.

Gender. Of the overall participants who completed the *Interaction and Satisfaction Survey*, 81% were female and 19% were male students. The response rate by gender for each format of instructional delivery is presented in Table 9. Overwhelmingly, the majority of the responding students were female and enrolled in online courses (65%). The majority of male students (14%) were also enrolled in online courses.

Table 9. Overall Survey Response Rates by Gender in Each Format of Instructional Delivery

Format	Female		Male	
	N	(%)	N	(%)
Course-in-a-Bag	92	9	22	2
Instructional Television	10	1	8	1
Online	672	65	140	14
Mixed Mode	59	6	21	2
Overall	833	82	191	19

Table 10 presents the data on perceived learner-learner interaction by gender for each format of instructional delivery. Data indicated that females reported higher mean learner-learner interaction scores for all four formats of instructional delivery. The highest mean for learner-learner interaction for both genders was reported for mixed mode courses, 3.23 for female students and 2.78 for male students. The lowest mean score for learner-learner interaction was reported for Course-in-a-Bag courses by both genders, 1.78 for female students and 1.78 for male students.

Table 10. Mean and Standard Deviation of Learner-Learner Interaction for Each Format of Instructional Delivery by Gender

	Female			Male		
Format	N	Mean	SD	N	Mean	SD
Course-in-a-Bag	92	1.78	.728	22	1.78	.704
Instructional Television	10	2.58	.468	8	2.34	.589
Online	672	2.79	.641	140	2.49	.665
Mixed Mode	59	3.23	.568	21	2.78	.697

The data on learner-instructor interaction for the four formats of instructional delivery by gender are shown in Table 11. The data indicated that female students reported higher mean learner-instructor interaction for all four formats of instructional delivery. Female students reported the highest learner-instructor interaction means in mixed mode courses (M = 3.68) while male students reported their highest learner-instructor interaction means in online courses (M = 3.45).

Table 11. Mean and Standard Deviation of Learner-Instructor Interaction for Each Format of Instructional Delivery by Gender

Format	Female			Male		
	N	Mean	SD	N	Mean	SD
Course-in-a-Bag	92	3.192	.634	22	2.948	.760
Instructional Television	10	3.214	.376	8	2.892	.702
Online	672	3.584	.471	140	3.447	.558
Mixed Mode	59	3.676	.459	21	3.401	.477

Results on the reported perceptions of learner-content interaction across the four formats of instructional delivery by gender are shown in Table 12. The data suggested that female students reported a higher mean learner-content interaction score in all four formats of instructional delivery. Female students reported highest learner-content interaction means in both mixed mode (M = 2.53) and Course-in-a-Bag courses (M = 2.53). Male students reported highest learner-content interaction means in the mixed mode courses (M = 2.44).

Table 12. Mean and Standard Deviation of Learner-Content Interaction for Each Format of Instructional Delivery by Gender

	Female			Male		
Format	N	Mean	SD	N	Mean	SD
Course-in-a-Bag	92	2.53	.625	22	2.39	.518
Instructional Television	10	2.37	.537	8	2.19	.559
Online	672	2.18	.517	140	2.11	.538
Mixed Mode	59	2.53	.531	21	2.44	.588

The data on learner-technology interaction in the four formats of instructional delivery by gender are shown in Table 13. The first question on the learner-technology portion of the survey determined the experience of the student with the current technology. The last four questions in this section determined the students' level of difficulty utilizing the technology and the impact of using the technology on participation and interaction in the distance course. A low reported score for these questions would signify less difficulty with the technology. The results indicated that male students reported a higher mean learner-technology interaction score in Course-in-a-Bag (M = 2.01), instructional television (M = 1.88), and mixed mode (M = 2.25) formats of instruction than female students. Female students reported a higher mean learner-technology interaction score in the online mode of delivery (M = 1.92) compared to males (M = 1.89). Overall, both male and female students reported highest learner-technology interaction means in mixed mode courses.

Table 13. Mean and Standard Deviation of Learner-Technology Interaction for Each Format of Instructional Delivery by Gender

	Female			Male		
Format	N	Mean	SD	N	Mean	SD
Course-in-a-Bag	92	1.65	.455	22	2.01	.799
Instructional Television	10	1.44	.375	8	1.88	.841
Online	672	1.92	.579	140	1.89	.629
Mixed Mode	59	2.10	.606	21	2.25	.683

The perceived student satisfaction data in the four formats of instructional delivery by gender are shown in Table 14. The results indicated that female students reported higher student satisfaction means than male students for all four formats of instructional delivery. Female students reported slightly higher satisfaction means in mixed mode courses (M = 3.596) over the online format of delivery (M = 3.592). Male students reported highest satisfaction means in online courses (M = 3.51).

Table 14. Mean and Standard Deviation of Student Perception of Satisfaction for Each Format of Instructional Delivery by Gender

	Female			Male		
Format	N	Mean	SD	N	Mean	SD
Course-in-a-Bag	92	3.44	.617	22	3.29	.737
Instructional Television	10	3.53	.431	8	2.99	.869
Online	672	3.59	.537	140	3.51	.534
Mixed Mode	59	3.60	.498	21	3.31	.506

Age. The *Interaction and Satisfaction Survey* was designed to collect information on the age of each participating student. The age groups offered as choices on the survey included the following: under 18, 18-25, 26-34, 35-44, 45-54, and 55 and over group. Of the students that responded to the survey, 0.5% were under 18, 35.5% were in the 18-25 range, 31.3% were in the 26-34 range, 21.5% were in the 35-44 range, 9.6% were in the 45-54 age range, and finally, 1.7% were in the 55 and over range. The descriptive data on students by age group for each format of instructional delivery are shown in Table 15.

Table 15. Participants by Age Group in Each Format of Instructional Delivery

	<18		18-25		26-34		35-44		45-54		≥55	
Format	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
CIB	1	0.1	31	3	40	4	26	3	15	1	1	.01
ITV	2	0.2	12	1	2	0.2	2	0.2	0	0	0	0
Online	2	0.2	281	27	260	25	182	18	73	7	14	1
MM	0	0	40	4	18	2	10	1	10	1	2	1
Total	5	0.5	364	35	320	31	220	22	98	9	17	3

The results of learner-learner interaction by age group for each format of instructional delivery are presented in Table 16. The data indicated that the 18-25 (M = 3.08), 26-34 (M = 3.22), 35-44 (M = 2.96), and 45-54 (M = 3.39) age groups reported the highest learner-learner interaction means in mixed mode courses. The under 18 (M= 2.81) and over 55 (M= 2.76) age group both reported highest learner-learner interaction means in online courses. The lowest learner-learner interaction was reported for Course-in-a-Bag courses by all age groups.

Table 16. Mean and Standard Deviation of Learner-Learner Interaction for Four Formats of Instructional Delivery by Age

	<18			18-25			26-34			35-44			45-54			≥55		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	1	1.75	0	31	1.78	.728	40	1.82	.711	26	1.62	.677	15	1.99	.826	1	1.00	0
ITV	2	2.42	.619	12	2.43	.550	2	2.63	.177	2	2.63	.884	0	0	0	0	0	0
OL	2	2.81	1.15	281	2.72	.683	260	2.81	.651	182	2.75	.604	73	2.57	.672	14	2.76	.549
MM	0	0	0	40	3.08	.569	18	3.22	.804	10	2.96	.629	10	3.39	.397	2	2.25	.530

The results on learner-instructor interaction for the four formats of instructional delivery by age group are shown in Table 17. The data suggested that the students in the 18-25 (M = 3.53), 26-34 (M = 3.68), 35-44 (3.66), and 45-54 (M = 3.73) age groups reported the highest scores in mixed mode courses. The 55 and older students reported the highest learner-instructor interaction means in online courses (M = 3.59). The highest learner-instructor interaction scores in the under 18 age were reported for Course-in-a-Bag delivery (M = 4.0). Students in the 26-34 (M = 3.16), 35-44 (M = 3.32), and 45-54 (3.15) age groups reported lowest learner-instructor interaction means in Course-in-a-Bag courses. Students in the under 18 (M = 3.214) and 18-25 age group (M = 2.86) reported lowest learner-instructor interaction means in instructional television courses while students over 55 reported lowest means in Course-in-a-Bag (M = 3.57) and mixed mode (M = 3.57) course instructional delivery formats.

Table 17. Mean and Standard Deviation of Learner-Instructor Interaction for Four Formats of Instructional Delivery by Age

	<18			18-25			26-34			35-44			45-54			≥55		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	1	4.00	0	31	3.01	.605	40	3.16	.820	26	3.32	.434	15	3.15	.649	1	3.57	0
ITV	2	3.21	.303	12	2.86	.510	2	3.64	.505	2	3.64	.303	0	0	0	0	0	0
OL	2	3.50	.707	281	3.50	.545	260	3.61	.417	182	3.58	.468	73	3.55	.550	14	3.59	.437
MM	0	0	0	40	3.53	.487	18	3.68	.579	10	3.66	.338	10	3.73	.340	2	3.57	.606

The data on learner-content interaction for the four formats of instructional delivery by age group are shown in Table 18. The data suggested that students in the under 18 (M = 2.5), 35-44 (M = 2.59), and 45-54 (M = 2.62) age group reported the highest learner-content interaction means in Course-in-a-Bag instruction. Students in the 18-25 (M = 2.53) and over 55 (M = 2.50) groups reported highest scores in mixed mode instruction. The 26-34 age group reported highest learner-content interaction means in instructional television (M = 2.58). The lowest learner-content interaction scores were reported in online courses for all age groups except the over 55 group. The over 55 age group students reported lowest means for learner-content interaction in Course-in-a-Bag courses (M = 1.83).

Table 18. Mean and Standard Deviation of Learner-Content Interaction for Four Formats of Instructional Delivery by Age

	<18			18-25			26-34			35-44			45-54			≥55		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	1	2.50	0	31	2.32	.446	40	2.56	.689	26	2.59	.706	15	2.62	.420	1	1.83	0
ITV	2	2.42	.589	12	2.21	.557	2	2.58	.118	2	2.33	.943	0	0	0	0	0	0
OL	2	2.17	.943	281	2.17	.582	260	2.19	.534	182	2.16	.456	73	2.09	.369	14	2.17	.448
MM	0	0	0	40	2.53	.601	18	2.42	.436	10	2.57	.615	10	2.53	.520	2	2.50	0

The data on learner-technology interaction for the four formats of instructional delivery by age group are shown in Table 19. The data indicated that students in all age groups, except the under 18 group, reported the highest learner-technology interaction means in mixed mode courses (18-25 M = 2.13, 26-34 M = 1.98, 35-44 M = 2.50, 45-54 M = 2.10, ≥55 M = 2.10). Students in the under 18 age group reported the highest learner-technology interaction means in online courses (M = 2.50). Students in the under 18 (M = 1.20) and 35-44 (M = 1.40) age group reported the lowest learner-technology interaction means in ITV courses. All other age groups reported lowest learner-technology interaction means in Course-in-a-Bag courses (18-25 M = 1.67, 26-34 M = 1.67, 45-54 M = 1.91, ≥55 M = 1.40).

Table 19. Mean and Standard Deviation of Learner-Technology Interaction for Four Formats of Instructional Delivery by Age

	<18			18-25			26-34			35-44			45-54			≥55		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	1	1.80	0	31	1.67	.340	40	1.67	.495	26	1.77	.694	15	1.91	.781	1	1.40	0
ITV	2	1.20	.283	12	1.70	.674	2	1.90	.990	2	1.40	.566	0	0	0	0	0	0
OL	2	2.50	1.273	281	1.97	.655	260	1.84	.565	182	1.93	.495	73	1.93	.601	14	1.83	.391
MM	0	0	0	40	2.13	.645	18	1.98	.470	10	2.50	.807	10	2.10	.568	2	2.10	.707

The data on perceived satisfaction in the four formats of instructional delivery across age groups are shown in Table 20. The results suggested that students in the 18-25 (M = 3.53), 45-54 (M = 3.60), and over 55 (M = 3.81) age groups reported highest satisfaction means in online courses. Students in the 35-44 (M = 3.79) and under 18 (M = 3.92) age groups reported highest satisfaction means in instructional television courses while students in the 26-34 age group reported highest means in mixed mode courses (M = 3.63). The lowest mean satisfaction was reported in Course-in-a-Bag courses for students in the under 18 (M = 3.00) and 35-44 (M = 3.39) age groups. Students in the 18-25 (M = 3.10) and 26-34 (M = 3.29) age groups reported the lowest mean satisfaction in instructional television courses while the students in the 45-54 (M = 3.36) and over 55 group (M = 3.29) were least satisfied with the mixed mode format.

Table 20. Mean and Standard Deviation of Students' Perceptions of Satisfaction for Four Formats of Instructional Delivery by Age

	<18			18-25			26-34			35-44			45-54			≥55		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	1	3.000	0	31	3.492	.556	40	3.360	.748	26	3.385	.620	15	3.450	.610	1	3.333	0
ITV	2	3.917	0	12	3.104	.756	2	3.292	.530	2	3.792	.059	0	0	0	0	0	0
OL	2	3.333	.707	281	3.534	.569	260	3.620	.546	182	3.562	.522	73	3.596	.440	14	3.810	.189
MM	0	0	0	40	3.423	.578	18	3.625	.422	10	3.725	.349	10	3.358	.484	2	3.292	.648

Ethnicity

Data were collected with the *Interaction and Satisfaction Survey* from students in six ethnic groups. The ethnic categories that were offered as options on the survey included African American, American Indian/Alaskan Native, Asian/Pacific Islander, Caucasian, Hispanic, and Unknown. Students who responded to the survey fell into the following groupings: African American (28.7%), American Indian/Alaskan Native (0.6%), Asian/Pacific Islander (2.2%), Hispanic (2.6%), White (63.2%), and Unknown (2.6%). Information on the four types of interaction and satisfaction for each format of instructional delivery was generated for each ethnic group. Table 21 shows the response rates for all ethnic groups for each format of instructional delivery.

Table 21. Overall Survey Response Rates by Participants' Ethnicity in Four Formats of Instructional Delivery.

	African American		American Indian		Asian		Hispanic		Caucasian		Unknown	
Format	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
CIB	42	4.10	0	0	0	0	2	.195	65	6.35	5	.489
ITV	3	.293	0	0	0	0	1	.098	14	1.37	0	0
Online	223	21.78	4	.391	21	2.05	22	2.15	522	50.98	20	1.95
MM	26	2.54	2	.195	2	.195	2	.195	46	4.49	2	.195
Total	294	28.7	6	0.6	23	2.25	27	2.6	647	63.2	27	2.63

The data on learner-learner interaction for the four formats of instructional delivery by ethnicity are shown in Table 22. The data indicated that all ethnic groups reported the highest learner-learner interaction means in mixed mode

courses (African American M = 3.27, American Indian M = 3.81, Asian M = 2.56, Hispanic M = 3.63, Caucasian M = 2.99, Unknown M = 3.88). African American (M = 2.07), Caucasian (M = 1.63), and the Unknown (M = 1.13) groups of students had the lowest mean learner-learner interaction in Course-in-a-Bag courses. American Indian (M = 2.81) and Asian (M = 2.49) students reported the lowest mean learner-learner interaction in online courses while Hispanic students (M = 1.00) had the lowest reported mean in instructional television courses.

Table 22. Mean and Standard Deviation of Learner-Learner Interaction for Four Formats of Instructional Delivery by Ethnicity

	African American			American Indian			Asian			Hispanic			Caucasian			Unknown		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	42	2.07	.706	0	0	0	0	0	0	2	2.31	.265	65	1.63	.689	5	1.13	.153
ITV	3	2.50	.661	0	0	0	0	0	0	1	1.00	0	14	2.57	.335	0	0	0
OL	223	2.80	.633	4	2.81	.125	21	2.49	.681	22	2.85	.653	522	2.73	.664	20	2.56	.647
MM	26	3.23	.626	2	3.81	.265	2	2.56	.442	2	3.63	.177	46	2.99	.618	2	3.88	0

The data for learner-instructor interaction in all four formats of instructional delivery by ethnic group are shown in Table 23. Results indicated that students in all ethnic groups, except Asian and Caucasian reported the highest learner-instructor interaction means in mixed mode courses (African American M = 3.62, American Indian M = 4.00, Hispanic M = 4.00, Caucasian M = 3.57, Unknown M = 4.00). Asian students reported highest means in online courses (M = 2.49) while Caucasian students reported highest means in both online and mixed mode formats (M = 3.57). Caucasian (M = 3.07) and Unknown students (M = 2.94) reported lowest learner-instructor interaction means in Course-in-a-Bag courses. African American (M = 3.29) and Hispanic (M = 1.86) students reported the lowest mean for learner-instructor interaction in instructional television courses. American Indian (M = 3.71) students reported online courses as having the lowest mean learner-instructor interaction while Asian students indicated that mixed mode courses had the least learner-instructor interaction (M = 3.00).

Table 23. Mean and Standard Deviation of Learner-Instructor Interaction for Four Formats of Instructional Delivery by Ethnicity

	African American			American Indian			Asian			Hispanic			Caucasian			Unknown		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	42	3.32	.541	0	0	0	0	0	0	2	3.57	.606	65	3.07	.731	5	2.94	.559
ITV	3	3.29	.655	0	0	0	0	0	0	1	1.86	0	14	3.11	.456	0	0	0
OL	223	3.57	.504	4	3.71	.481	21	3.53	.429	22	3.51	.470	522	3.57	.482	20	3.44	.612
MM	26	3.62	.410	2	4.00	0	2	3.00	.606	2	4.00	0	46	3.57	.508	2	4.00	0

The data reflecting the participants' perceived learner-content interaction in all four formats of instructional delivery by ethnicity are shown in Table 24. The results showed that African American students (M = 2.67) reported the highest learner-content interaction means in Course-in-a-Bag and instructional television courses. American Indian students (M = 2.58) indicated that online courses provided the most learner-content interaction. All other ethnic groups had the highest means in learner-content interaction in mixed mode courses (Asian M = 2.58, Hispanic M = 2.83, Caucasian M = 2.39, Unknown M = 4.00). Hispanic students (M = 2.17) reported instructional television courses as having the lowest means for learner-content interaction while American Indian students (M = 2.42) reported mixed mode courses as having the lowest mean. The Unknown group indicated that the Course-in-a-Bag format provided the lowest mean learner-content interaction (M = 2.73). All other ethnic groups of students reported the lowest means for learner-content interaction in online courses (African American M = 2.33, Asian, M = 2.02, Caucasian M = 2.09).

Table 24. Mean and Standard Deviation of Learner-Content Interaction for Four Formats of Instructional Delivery by Ethnicity

	African American			American Indian			Asian			Hispanic			Caucasian			Unknown		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	42	2.67	.699	0	0	0	0	0	0	2	2.67	.236	65	2.37	.531	5	2.73	.435
ITV	3	2.67	.882	0	0	0	0	0	0	1	2.17	0	14	2.21	.469	0	0	0
OL	223	2.33	.609	4	2.58	.687	21	2.02	.411	22	2.37	.466	522	2.09	.469	20	3.15	.382
MM	26	2.56	.523	2	2.42	.354	2	2.58	.354	2	2.83	0	46	2.39	.492	2	4.00	0

The reported learner-technology interactions for each of the four formats of instructional delivery by ethnic group are shown in Table 25. African American (M = 2.23), Caucasian (M = 2.07), and Unknown students (M = 2.80) reported the highest learner-technology interaction means in mixed mode courses. American Indian (M = 2.25) and Asian students (M = 1.86) reported the highest learner-technology interaction means in online courses. Hispanic students reported the highest learner-technology means in instructional television (M = 3.00). Hispanic (M = 1.60) and unknown students (M = 1.64) reported the lowest means for learner-technology interaction in Course-in-a-Bag courses. African American (M = 1.60) and Caucasian (M = 1.54) students reported lowest means in instructional television courses while American Indian (M = 1.90) and Asian students (M = 1.50) indicated mixed mode as having the lowest means.

Table 25. Mean and Standard Deviation of Learner-Technology Interaction for Four Formats of Instructional Delivery by Ethnicity

	African American			American Indian			Asian			Hispanic			Caucasian			Unknown		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	42	1.67	.577	0	0	0	0	0	0	2	1.60	0	65	1.76	.567	5	1.64	.089
ITV	3	1.60	.529	0	0	0	0	0	0	1	3.00	0	14	1.54	.589	0	0	0
OL	223	1.94	.662	4	2.25	.526	21	1.86	.507	22	1.83	.479	522	1.91	.566	20	1.87	.478
MM	26	2.23	.704	2	1.90	.141	2	1.50	.424	2	2.60	.849	46	2.07	.578	2	2.80	0

The data on perceived satisfaction for all four formats of instructional delivery by ethnic group are shown in Table 26. Online and mixed mode courses had the highest means for satisfaction. African American (M = 3.62), American Indian (M = 3.98), and Caucasian students (M = 3.56) reported the highest satisfaction means in online courses. Asian (M = 3.42), Hispanic (M = 3.92), and Unknown students (M = 4.00) reported the highest mean for satisfaction in mixed mode courses. African American (M = 3.44) and Caucasian students (M = 3.36) reported their lowest satisfaction means with Course-in-a-Bag courses. Asian (M = 3.40) and Unknown students (M = 3.53) reported the lowest satisfaction means in online courses. American Indian students (M = 3.19) reported their lowest mean for satisfaction in mixed mode courses while Hispanic students (M = 1.08) reported instructional television with the lowest mean.

Table 26. Mean and Standard Deviation of Student Perception of Satisfaction for Four Formats of Instructional Delivery by Ethnicity

	African American			American Indian			Asian			Hispanic			Caucasian			Unknown		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
CIB	42	3.44	.672	0	0	0	0	0	0	2	3.75	.236	65	3.36	.641	5	3.65	.462
ITV	3	3.58	.363	0	0	0	0	0	0	1	1.08	0	14	3.39	.459	0	0	0
OL	223	3.62	.506	4	3.98	.042	21	3.40	.534	22	3.65	.460	522	3.56	.555	20	3.53	.478
MM	26	3.47	.460	2	3.19	0	2	3.42	.707	2	3.92	0	46	3.50	.554	2	4.00	0

Summary. In general, females reported higher learner-learner, learner-instructor, and learner-content interaction means than their male student counterparts. Additionally, females reported higher satisfaction means than male students in all courses offered in the four formats of distance education instructional delivery.

In general, the highest means of learner-learner, learner-instructor, and learner-technology interaction for most age groups occurred in mixed mode courses. Satisfaction means were similar for all age groups regardless of the format of instructional delivery.

The student participants in most ethnic groups reported higher learner-learner, learner-instructor, and learner-content interaction means in mixed mode courses. Higher learner-technology interaction means were more dispersed with African American, Caucasian, and unknown students reporting higher learner-technology interaction means in the mixed mode format. American Indian and Asian students reported higher learner-technology interaction means in the online format, while Hispanic students reported highest means in instructional television. Students in all ethnic groups were most satisfied with online and mixed mode formats of instructional delivery.

Research Question 2

Do perceptions of interaction and satisfaction differ among students enrolled in four formats of distance education instructional delivery?

Null Hypothesis 1

H_{O1}: No difference exists in student perception of learner-learner interaction among students enrolled in four formats of distance education instructional delivery.

This hypothesis was addressed by using a one-way Analysis of Variance (ANOVA) of the means of questions 1-8 from the *Interaction and Satisfaction Survey* for each of the four formats of instructional delivery. The perceived interaction and satisfaction means for the four formats of instructional delivery is shown in Table 27.

Table 27. Perceived Interaction and Satisfaction Means of Students Enrolled in Four Formats of Distance Education

	Learner-Learner Interaction		Learner-Instructor Interaction		Learner-Content Interaction		Learner-Technology Interaction		Satisfaction	
	M	N	M	N	M	N	M	N	M	N
Course-in-a-Bag	1.78[a]	114	3.17[a,c,d]	114	2.50[a]	114	1.72[a]	114	3.41[a,b]	116
Instructional Television	2.47[b]	18	3.07[c]	18	2.29[a]	18	1.63[a]	18	3.29[b]	18
Online	2.74[b,c]	812	3.56[b,d]	812	2.17[a]	812	1.92[a]	812	3.58[a,c]	812
Mixed Mode	3.11[c]	80	3.60[b]	80	2.51[a]	80	2.14[a]	80	3.52[a,b]	80

Note. Means with different coefficients indicate a significant difference at p=.05.

Findings. The ANOVA results for differences in learner-learner interaction for the four formats of instructional delivery are shown in Table 28.

The data showed that significant differences existed between the students' perceptions of learner-learner interaction across the four formats of instructional delivery, $F(3, 28) = 16.83$, $p<.05$. Hypothesis 1 was not accepted for the variable learner-learner interaction across the four formats of instruction.

Table 28. ANOVA Between Learner-Learner Interaction and Format of Instructional Delivery

	Sum of Squares	df	Mean Square	F	p
Between Groups	7.63	3	2.54	16.83	.000*
Within Groups	4.23	28	.151		
Total	11.85	31			

*p is significant at the 0.05 level

To determine the pairwise differences between the formats of instructional delivery on learner-learner interaction, a post hoc Scheffé analysis was conducted (p=.05). The results indicated that significantly less learner-learner interaction existed for the Course-in-a-Bag (M=1.78) format than the instructional television (M = 2.47), online (M = 2.74), and mixed mode (M = 3.11) formats of instructional delivery. Additionally, significantly less reported learner-learner interaction existed in instructional television (M = 2.47) than in mixed mode (M = 3.11) instructional delivery.

Null Hypothesis 2

H_{O2}: No difference exists in student perception of learner-instructor interaction among students enrolled in four formats of distance education instructional delivery.

This hypothesis was addressed by using a one-way ANOVA on the means of questions 9-15 of the *Interaction and Satisfaction Survey* for each of the four formats of instructional delivery.

Findings. The ANOVA results reflecting differences in learner-instructor interaction across the four formats of instruction are shown in Table 29. The data indicated that significant differences existed in learner-instructor interaction between the four formats of instructional delivery, $F(3,24) = 7.28$, $p<.05$. Hypothesis 2 was not accepted for the variable learner-instructor interaction across the four formats of instructional delivery.

Table 29. ANOVA Between Learner-Instructor Interaction and Format of Instructional Delivery

	Sum of Squares	df	Mean Square	F	p
Between Groups	1.54	3	.513	7.28	.001*
Within Groups	1.692	24	.071		
Total	3.23	27			

*p is significant at the 0.05 level

To determine the pairwise differences between the formats of instructional delivery on learner-instructor interaction, a post hoc Scheffé analysis was

conducted (p=.05). The data indicated that significantly less learner-instructor interaction existed for the Course-in-a-Bag (M=3.17) format of instructional delivery compared to mixed mode (M=3.60) courses. Additionally, significant differences existed between instructional television (M=3.07) and both mixed mode (M=3.60) and online (M=3.56) formats of instructional delivery.

Null Hypothesis 3

H_{O3}: No difference exists in student perception of learner-content interaction among students enrolled in four formats of distance education instructional delivery.

This hypothesis was addressed by using one-way ANOVA on the means of questions 16-21 from the *Interaction and Satisfaction Survey* for each of the four formats of instructional delivery.

Findings. The results of the ANOVA comparing the means of learner-content interaction across the formats of instructional delivery are shown in Table 30. The data indicated that no significant differences existed in learner-content interaction for the formats of instructional delivery in this study, $F(3, 20) = .196$, $p=.898$. Hypothesis 3 was accepted for the variable learner-content interaction across the four formats of instructional delivery.

Table 30. ANOVA Between Learner-Content Interaction and Format of Instructional Delivery

	Sum of Squares	df	Mean Square	F	p
Between Groups	.504	3	.168	.196	.898
Within Groups	17.15	20	.858		
Total	17.66	23			

Null Hypothesis 4

H_{O4}: No difference exists in student perception of learner-technology interaction among students enrolled in four formats of distance education instructional delivery.

This hypothesis was investigated by using one-way ANOVA on the means of questions 22-26 from the *Interaction and Satisfaction Survey* for each of the four formats of instructional delivery.

Findings. The results of the ANOVA comparing the means of learner-technology interaction across the four formats of instructional delivery are shown in Table 31. The data indicated that no significant differences existed in students' perceptions of learner-technology interaction for the four formats of instructional delivery in this study, $F(3, 16) = .583$, $p=.635$. Null hypothesis 4 was accepted for the variable of learner-technology interaction across the four formats of instructional delivery.

Table 31. ANOVA Between Learner-Technology Interaction and Format of Instructional Delivery

	Sum of Squares	df	Mean Square	F	p
Between Groups	.748	3	.249	.583	.635
Within Groups	6.842	16	.428		
Total	7.590	19			

Null Hypothesis 5

H_{O5}: No difference exists in student perception of overall interaction among students enrolled in four formats of distance education instructional delivery.

This hypothesis was investigated by using one-way ANOVA on the means of questions 1-26 from the *Interaction and Satisfaction Survey* for the four formats of instructional delivery. Table 32 shows the means of perceived overall interaction in the four formats of instructional delivery.

Table 32. Means of Overall Interaction for Each Format of Distance Education Instructional Delivery

Format	Overall Interaction	
	M	N
Course-in-a-Bag	2.31[a]	114
Instructional Television	2.43[a]	18
Online	2.67[a,b]	812
Mixed Mode	2.92[b]	80

Note. Means with different coefficients indicate a significant difference at p=.05.

Findings. Results from the ANOVA comparing overall interaction means across the four formats of instructional delivery are shown in Table 33. The data indicated that statistically significant differences existed in overall interaction means for the four formats of instructional delivery in the study $F(3, 100) = 3.00$, $p<.05$. Hypothesis 5 was not accepted for the variable overall interaction across the four formats of instructional delivery.

Table 33. ANOVA Between Perceived Overall Interaction Means and Format of Instructional Delivery

	Sum of Squares	df	Mean Square	F	p
Between Groups	5.68	3	1.89	3.00	.034*
Within Groups	63.10	100	.631		
Total	68.79	103			

*p is significant at the 0.05 level

To determine the pairwise differences between the formats of instructional delivery on overall interaction, a post-hoc LSD analysis was conducted (p=.05). Scheffé analysis was not conducted with this null hypothesis because it was found to be too conservative and did not return differences of any significance. The data indicated that significantly higher overall interaction means were reported in mixed mode (M=2.92) formats as compared to the Course-in-a-Bag (M=2.31) and instructional television (M=2.43) formats of instructional delivery.

Null Hypothesis 6

H_{O6}: No difference exists in student perception of satisfaction among students enrolled in four formats of distance education instructional delivery.

This hypothesis was investigated by using one-way ANOVA on the means of questions 27-38 from the *Interaction and Satisfaction Survey* for the four formats of instructional delivery.

Findings. Results from the ANOVA comparing satisfaction means across the four formats of instructional delivery are shown in Table 34. The data indicated that statistically significant differences existed in satisfaction means for the four formats of instructional delivery in the study $F(3, 44) = 3.78$, $p<.05$. Hypothesis 6 was not accepted for the variable of satisfaction across the four formats of instruction.

Table 34. ANOVA Between Perceived Satisfaction Means and Format of Instructional Delivery

	Sum of Squares	df	Mean Square	F	P
Between Groups	.574	3	.191	3.777	.017*
Within Groups	2.231	44	.051		
Total	2.805	47			

*p is significant at the 0.05 level

To determine the pairwise differences between the formats of instructional delivery on satisfaction, a post hoc Scheffé analysis was conducted (p=.05). The

data indicated that significantly less satisfaction was reported in ITV (M=3.292) as compared to the OL (M=3.578) format of instructional delivery.

Research Question 3

Do significant relationships exist between the perceptions of interaction and satisfaction of the students enrolled in four formats of distance education instructional delivery?

A mean interaction score was calculated for each participant in each of the four types of interaction. Additionally, a mean satisfaction score was calculated. Pearson Product-Moment Correlation coefficients were generated to address the four research hypotheses that related the dependent and independent variables in this research question.

Null Hypothesis 7

H_{O7}: No relationship exists between learner-learner interaction and satisfaction among students enrolled in four formats of distance education instructional delivery.

Findings. The correlation coefficients generated between learner-learner interaction and satisfaction for the four formats of instructional delivery are shown in Table 35. A significant relationship appears to exist between learner-learner interaction and satisfaction for all four formats of instructional delivery offered at the institution of interest. The relationship between learner-learner interaction and satisfaction was significant at the $p = .05$ level in all formats of

instructional delivery. The correlation coefficient between learner-learner interaction and satisfaction was strongest in instructional television (r=.607) and weakest in Course-in-a-Bag (r=.237), however all were statistically significant. Null hypothesis 7 was not accepted for the variables interaction and satisfaction across the four formats of instructional delivery.

Table 35. Pearson Product-Moment Correlation Coefficients for Learner-Learner Interaction and Satisfaction for Formats of Instructional Delivery

Format	*N*	*r*	*p*
Course-in-a-Bag	114	.237	.011*
Instructional Television	18	.607	.008*
Online	812	.353	.000*
Mixed Mode	80	.396	.000*

*p is significant at 0.05

Null Hypothesis 8

H_{O8}: No relationship exists between learner-instructor interaction and satisfaction among students enrolled in four formats of distance education instructional delivery.

Findings. The Pearson Product-Moment Correlation coefficients displaying the relationship between these variables are shown in Table 36. A statistically significant relationship appears to exist between learner-instructor interaction and satisfaction at the p = .05 level for all four formats of instructional delivery. A stronger correlation existed between learner-instructor interaction and satisfaction in instructional television courses (r=.635) while the weakest

correlation was seen in Course-in-a-Bag courses (r=.377). Null hypothesis 8 was not accepted for the variables of learner-instructor interaction and satisfaction across the four formats of instructional delivery.

Table 36. Pearson Product-Moment Correlation Coefficients for Learner-Instructor Interaction and Satisfaction for Four Formats of Instructional Delivery

Course	*N*	*r*	*p*
Course-in-a-Bag	114	.377	.000*
Instructional Television	18	.635	.005*
Online	812	.443	.000*
Mixed Mode	80	.523	.000*

*p is significant at 0.05

Null Hypothesis 9

H_{O9}: No relationship exists between learner-content interaction and satisfaction among students enrolled in four formats of distance education instructional delivery.

Findings. Results of the exploration of this relationship are shown in Table 37. A statistically significant relationship appears to exist between learner-content interaction and satisfaction at the p = 0.5 level in Course-in-a-Bag courses, in online courses, and in mixed mode courses. The strongest correlation coefficients existed between learner-content interaction and satisfaction in Course-in-a-Bag courses (r = .470) and the weakest correlation coefficient was seen in instructional television courses (r = .092). Hypothesis 9 was not accepted

for the variables of learner-content interaction and satisfaction for the Course-in-a-Bag, online, and mixed mode formats of instructional delivery.

Table 37. Pearson Product-Moment Correlation Coefficients for Learner-Content Interaction and Satisfaction for Four Formats of Instructional Delivery

Instructional Format	*N*	*r*	*p*
Course-in-a-Bag	114	.470	.000*
Instructional Television	18	.092	.715
Online	812	.226	.000*
Mixed Mode	80	.304	.006*

*p is significant at 0.05

Null Hypothesis 10

H_{10}: No relationship existed between learner-technology interaction and satisfaction among students enrolled in four formats of distance education instructional delivery.

Findings. Results of the correlation data between learner-technology interaction and satisfaction in each of the four formats of instructional delivery are presented in Table 38. A negative correlation existed between learner-technology interaction and satisfaction across the four formats of instructional delivery. Because of the way questions on the *Interaction and Satisfaction Survey* were written, greater learner-technology interaction may indicate that the students experienced difficulties with the technology required for their course. The correlation between learner-technology interaction and satisfaction was significant at the p = .05 level in instructional television and in online courses.

The strongest negative correlation between learner-technology interaction and satisfaction was seen in instructional television courses (r = -.649). The weakest negative correlation between learner-technology interaction and satisfaction was seen in Course-in-a-Bag courses (r = -.027). Null hypothesis 10 was not accepted for the variables of learner-technology interaction and satisfaction for the instructional television and online formats of instructional delivery.

Table 38. Pearson Product-Moment Correlation Coefficients for Learner-Technology Interaction and Satisfaction for Four Formats of Instruction

Instructional Format	*N*	*r*	*p*
Course-in-a-Bag	114	-.027	.776
Instructional Television	18	-.649	.004*
Online	812	-.278	.000*
Mixed Mode	80	-.213	.058

*p is significant at 0.05

Summary

This section included the analysis of the data for the three research questions that guided the study. Overall, eight of the ten null hypotheses were not accepted.

The first part of this section presented and analyzed the interaction and satisfaction data for different demographic variables. Specifically, data was presented on the four types of interaction and satisfaction in each of the four formats of instructional delivery for student participants based on age, ethnicity, and gender.

The second part of this section presented data that addressed differences between the overall interaction, the four types of interaction, and satisfaction in the four formats of instructional delivery. Statistically significant differences were found in learner-learner interaction, learner-instructor interaction, overall interaction, and satisfaction across the four formats of instructional delivery. No significant differences were found in learner-content interaction and learner-technology interactions across the four formats of instructional delivery. Four of the null hypotheses were not accepted that addressed research question 2.

Part three of this section presented data on the relationships between the four types of interaction and satisfaction in each format of instructional delivery. Statistically significant relationships were shown to exist between learner-learner interaction and satisfaction as well as learner-instructor interaction and satisfaction in all formats of instructional delivery. Learner-technology was significantly correlated to satisfaction in the Course-in-a-Bag, online, and mixed mode format of delivery. A statistically significant inverse correlation was shown to exist between learner-technology interaction and satisfaction in the instructional television and online formats of instructional delivery.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this chapter is to present an overall summary of the study, a summary of the findings and conclusions, general recommendations, and suggestions for future research. The purpose of the study was three-fold. First, the study measured the effect of four distance education instructional delivery formats on perceived interaction. Second, the study examined the effect of four distance education instructional delivery course formats on perceived student satisfaction. Finally, the study looked for relationships between the four types of interaction and satisfaction in the four formats of instructional delivery.

The first chapter of the study provided information on the prevalence of distance learning with special attention to the community college setting. Types of instructional delivery formats were described as well as the types of interaction each provides. The four types of interaction and satisfaction were the dependent variables in the study. The formats of instructional delivery and the demographic variables were the independent variables in the study. A brief methodology and definition of terms also was included in the first chapter. The study was framed by Moore's *Theory of Transactional Distance* which helped define the research questions. Three research questions provided in Chapter 1 guided the direction of the study.

The second chapter provided a review of the literature on distance education. Specifically, the literature review included a brief history of distance education including a definition. A general description of the distance education student also was included in Chapter 2. Four types of interaction, learner-learner, learner-instructor, learner-content, and learner-technology, were described and the importance of interaction in distance education was emphasized. Additionally, descriptions of the four instructional delivery methods were included along with information on interaction and satisfaction inherent in each format. Finally, Chapter 2 included a description of Moore's *Theory of Transactional Distance* and how it served as a framework for the study.

Chapter 3 linked Moore's *Theory of Transactional* Distance to the research design and described the research survey methodology used in the study. Data collection procedures and selection of the sample were included as well. The chapter explained the six null hypotheses investigated to address research question two including dependent and independent variables. Additionally, the chapter included the four null hypotheses investigated to address research question three including dependent and independent variables. The development of the *Interaction and Satisfaction Survey* was thoroughly described. A description of the participants and the institution also were included in Chapter 3.

Chapter 4 provided a presentation of the survey results and data analysis. Data were analyzed and organized based on the three research questions and ten null hypotheses that guided the study. Descriptive statistics were used to present the data on the perception of interaction and satisfaction in the four formats of

distance education instructional delivery. Tables were also included that presented interaction and satisfaction data by the demographic variables of gender, age, and ethnicity. The tables included means and standard deviations for the four types of interaction and satisfaction in each of the four formats of instructional delivery. Analysis of variance tables were presented to address differences in each of the four types of interactions and satisfaction across the four methods of instructional delivery. Finally, Pearson Product Moment correlation coefficients were presented to show the relationships between each of the four types of interaction and satisfaction for the four formats of instructional delivery.

This chapter contains the summary, conclusions, and recommendations drawn from the study. The study is summarized within the context of each of the research questions and conclusions include synthesis and analysis with relevant literature. Recommendations for current administrators, policymakers, and for future research are addressed at the end of Chapter 5.

Findings and Conclusions

The purpose of the study was to examine perceptions of interaction and satisfaction in courses offered by four formats of distance education instructional delivery at a community college. Three research questions guided the study. Research question one investigated perceived interaction and satisfaction for students enrolled in four formats of instructional delivery and also included data by the demographic variables gender, age, and ethnicity. The second research

question addressed differences in students' perception of interaction and satisfaction across the four formats of instructional delivery. Finally, the presence of significant relationships between the students' perceptions of interaction and satisfaction in the four formats of instructional delivery was investigated in the third research question.

The majority of the participants in the study were Caucasian women (81%). Sixty-four percent of the sample was above the age of 25 and most participants were enrolled in online courses (79%).

In general, students perceived the most learner-learner, learner-instructor, and learner-technology interaction in mixed mode formats of instructional delivery. Reported means for learner-content interaction were highest in mixed mode however, Course-in-a-Bag learner-content interaction means were only marginally less. Finally, highest satisfaction means were reported in the online format with mixed mode satisfaction means only slightly behind.

Female students reported higher means for learner-learner interaction, learner-instructor interaction, learner-content interaction, and satisfaction than male students in all formats of instructional delivery in this study. Male students reported higher learner-technology interaction means in all formats except online instruction.

All age groups except the oldest (>55) and the youngest (<18) and all ethnic groups showed the highest learner-learner interaction means in the mixed mode format of instructional delivery. Similarly, all age groups with the exception of the under 18 group and the over 55 group and all ethnic groups with

the exception of the Asian group reported mixed mode courses highest in learner-instructor interaction. Additionally, both genders, three of the six ethnic groups, and five of the six age groups reported lowest scores for learner-content interaction in online course formats.

When the participants were studied based upon age, all age groups with the exception of the under 18 group, reported highest means for learner-technology interaction in mixed mode courses. When the same sample population is investigated based on ethnicity, three groups reported highest learner-technology interaction scores for mixed mode and two groups indicated online course means were highest.

Overall, the satisfaction means were high for all formats of instruction. Males reported highest satisfaction in online courses while females reported the most satisfaction in mixed mode formats of delivery. When the participants were categorized by age instructional television, online, and mixed mode courses were reported as the most satisfying formats of instructional delivery. When the participants were categorized by ethnicity online and mixed mode course formats were reported to be most satisfying.

The study found that significant differences existed between perceived interaction and satisfaction in the four formats of instructional delivery. Specifically, learner-learner and learner-instructor interaction was significantly less in Course-in-a-Bag formats compared to the other instructional delivery formats. The instructional television format also had significantly lower means in learner-learner and learner-instructor interaction. No significant differences were

observed in the learner-content or the learner-technology interaction across the four formats of instructional delivery. Significant differences were found in the amount of perceived overall interaction across the formats of instructional delivery. Mixed mode courses had a significantly higher overall interaction mean when compared to Course-in-a-Bag or instructional television formats. Significant differences also were found in the amount of perceived satisfaction across the four formats of instructional delivery. Instructional television formats had significantly lower satisfaction means compared to online formats. Online courses had the highest means for reported satisfaction but were only significantly higher than instructional television.

Significant positive relationships existed between learner-learner interaction and satisfaction and between learner-instructor interaction and satisfaction in all formats of distance education instructional delivery with alpha set at .05. Learner-content interaction was significantly related to satisfaction in all formats except instructional television with alpha set at .05. Finally, learner-technology interaction was significantly, inversely related to satisfaction in the instructional television and online formats of distance education instructional delivery.

Findings and Conclusions by Research Question

Three research questions guided the study. The first explored the dependent variables interaction and satisfaction in each format of instructional delivery and included the demographic variables gender, age, and ethnicity. The

second research question was addressed by six null hypotheses. Four null hypotheses explored the differences in each of the four types of interaction across the four formats of instructional delivery. The fifth null hypothesis explored differences in overall interaction across the four formats of instructional delivery. The sixth null hypothesis investigated differences in overall satisfaction across the four formats of instructional delivery. The third research question was addressed by four null hypotheses. Each null hypothesis examined whether a relationship existed between one of the types of interaction and satisfaction across the four formats of instructional delivery.

The data used in the study was collected from community college students enrolled in distance education courses in an institution in the Southeastern United States. All students enrolled in distance education courses in the Fall 2006 semester were invited to participate in the *Interaction and Satisfaction Survey*. Descriptive statistics were used to analyze the demographic data required to address the first research question. The second research question examined differences in interaction and satisfaction between formats of instruction. Differences in interaction and satisfaction across the formats of delivery were calculated using ANOVA testing at the .05 level of significance. In order to address the third research question, relationships between each of the types of interaction and satisfaction in all four formats of instruction were explored using Pearson Product Moment correlation testing at the .05 level of significance.

Research Question One. Research question one explored participating students' perceptions of interaction and satisfaction in four formats of distance

education instructional delivery. Students enrolled in distance education courses reported the highest learner-learner, learner-instructor, and learner-technology interaction means in the mixed mode format. Learner-content interaction means were also highest in the mixed mode format however the Course-in-a-Bag format provided nearly similar learner-content interaction means. Perceived satisfaction means were highest in online courses followed very closely by online satisfaction means.

The first research question further addressed interaction and satisfaction across the four formats of instructional delivery for the demographic variables gender, age, and ethnicity. The results of the survey indicate that the majority of the participants were female (81%), were over the age of 25 (64%), were Caucasian (63%), and were enrolled in an online course (79%).

When the sample population was studied by gender a few commonalities were revealed. Females reported higher means for learner-learner interaction, learner-instructor interaction, learner-content interaction, and satisfaction than male participants in all formats of instruction. Males reported higher learner-technology interaction means for all formats of instruction except online courses.

When the sample population was categorized by age group all students except the oldest (≥55) and the youngest (<18) reported the highest means for learner-learner and learner-instructor interaction in mixed mode courses. Additionally, all age groups except the under 18 group indicated that mixed mode courses offered the greatest learner-technology interaction means. Learner-content interaction was reported to be lowest in online courses by all age groups

except the over 55 group. Satisfaction scores were high for all age groups and no single format of instruction seemed to be overwhelmingly more satisfying.

Categorizing the participants by ethnicity showed many similar results. All ethnic groups reported highest learner-learner interaction means in mixed mode courses. The highest learner-instructor interaction means were reported in the mixed mode course format by all ethnic groups except the Asian group. Four of the six ethnic groups indicated highest learner-content interaction scores in the mixed mode format and three of the six groups reported lowest scores in online courses. Learner-technology interaction scores were dispersed based on ethnicity. Online and mixed mode formats were indicated to be the most satisfactory formats of instruction when students were categorized by ethnicity. Three groups reported online as being the most satisfying format while three other groups reported highest satisfaction means in the mixed mode format.

Conclusion One. Community college students who enroll in distance education are more likely to be female, to be over the age of 25, to be Caucasian, and to be enrolled in an online course.

The literature contains studies that focus on characteristics of distance learners in various formats compared to traditional students. Few studies examined the characteristics of distance education community college students in multiple instructional delivery settings. However, examination of the literature does provide some support for the conclusion drawn from the sample in this study.

Current statistics on distance education indicate that the online format is extremely popular with nearly 3.2 million students enrolled in higher education during the Fall 2005 semester (Allen & Seaman, 2006). In light of this information, it does not seem surprising that a large number of student participants are enrolled in the online format of instructional delivery. Information in the literature also suggests that distance education students are more often female, older, and may live farther from campus than a traditional student (Valentine, 2002; Heiens & Hulse, 1995; Wilson, 1991). Literature on online students suggests that these distance education participants may have greater work and childcare responsibilities (Dutton, Dutton, & Perry, 2002).

Quantification of the demographic information on the student participants helped the researchers better understand the sample examined in the study. In this study, 81% of the participants were female, 64% were over the age of 25, 63% were Caucasian, and 79% were enrolled in online courses. These characteristics of community college distance learners were fairly consistent with the previous research in the literature addressing distance student characteristics.

*Conclusion Two. S*tudents perceived the highest interaction means in the mixed mode format of instructional delivery.

Conclusion Three. Students perceived highest satisfaction means in the online format of instructional delivery.

The integration of online and fact-to-face instruction returns spontaneity and the human touch to online instruction while returning flexibility and reflectivity to face-to-face instruction (Bonk & Kim, 2004;

Garrison & Kanuka, 2004; Osguthorpe & Graham, 2003; Wonacott, 2002). Additionally, the literature indicates that mixed mode formats provide a richer experience with more effective and satisfying learning (Kerres & DeWitt, 2003;Singh, 2003). The results from this study support the findings in the literature.

Research Question 2. The second research question addressed differences in interaction and satisfaction across the four formats of instruction. Six null hypotheses explored this research question.

Null Hypothesis One. The first null hypotheses suggested that no difference existed between learner-learner interaction across the four formats of instructional delivery. The results of the ANOVA testing indicated that significant differences were found at the .05 level. Post hoc Scheffé analysis indicated that learner-learner interaction in Course-in-a-Bag (M = 1.778) was significantly lower than all other formats (M=2.472 (instructional television); M=2.740 (online); M=3.114 (mixed mode)). In addition, learner-learner interaction in instructional television (M=2.472) was significantly lower than in mixed mode (M=3.114).

Null Hypothesis Two. The second null hypotheses stated that no difference existed in the student perception of learner-instructor interaction across the four formats of instruction. The results of the ANOVA testing suggested that significant differences existed. Post hoc Scheffé analysis indicated that learner-instructor interaction was significantly lower in Course-in-a-Bag (M=3.167)

courses compared to mixed mode (M=3.604). Learner-instructor interaction also was lower in instructional television (M=3.071) compared to both online (M=3.561) and mixed mode (M=3.604) methods of delivery.

Null Hypothesis Three. The third null hypothesis suggested that no difference existed between the reported amounts of learner-content interaction across the four formats of instructional delivery. ANOVA testing revealed that no significant differences existed in learner-content interaction across the four formats of instructional delivery at the p=.05 level.

Null Hypothesis Four. The fourth null hypothesis stated that no significant difference existed in learner-technology interaction across the four formats of instruction. ANOVA testing confirmed that no significant differences were found in learner-technology interaction across the four formats of instructional delivery at the p=.05 level.

Null Hypothesis Five. The fifth null hypothesis stated that no significant difference existed in overall interaction across the four formats of instruction. ANOVA testing revealed that significant differences existed between overall interaction across the four formats of delivery at the p=.05 level. Post hoc LSD analysis revealed that students in mixed mode (M=2.92) formats perceived significantly higher overall interaction means than in instructional television (M=2.43) or Course-in-a-Bag formats (M=2.31).

Conclusion Four. Students' perceptions of interaction were significantly different in courses offered in different formats of distance education instructional delivery. Specifically, students'

perceptions of learner-learner and learner-instructor interaction were significantly different in courses offered in different formats of distance education instructional delivery.

These results support Moore's *Theory of Transactional Distance* by reinforcing that the medium of communication does influence dialogue and transactional distance. Specifically, Moore states that increased opportunity for communication will increase dialogue and decrease transactional distance. Since mixed mode formats offer a face-to-face component it can be assumed that the opportunity for communication is increased. This study suggests that the more interactive mixed mode format offers significantly higher learner-learner and learner-instructor interaction means, a measure of dialogue, than the other formats of instruction studied. Additionally, transactional distance should be lower as it is often caused by the separation of the learner from the instructor.

The literature contained many studies that compared various single formats of distance education to traditional face-to-face education. Few studies were found that compared multiple distance education formats to each other especially with respect to various types of interaction.

The literature indicated that the interactive capabilities available to the students vary depending on the format of delivery employed (Anderson, 2004; Anderson, 2003; Roblyer & Wiencke, 2004). For example, Anderson (2004) indicated that high interactivity mediums include two-way transmission of communication such as video conferencing and computer conferencing. Low

interactivity mediums include one-way transmission technologies such as correspondence and television courses (Anderson, 2004). The literature indicated that while Course-in-a-Bag is a flexible mode of learning, some sacrifice of learner-learner and learner-instructor interaction can be expected as a trade off (Schittek Janda et al, 2005; Anderson, 2003b). Technological distance in instructional television courses can reduce the amount of learner-learner and learner-instructor interaction that occurs (Anderson, 2002; Wheeler, Batchelder & Hampshire, 1996). Additionally, online courses have been criticized for their lack of interaction and potential isolation (Clare, 2001; Hay et al, 2004, Johnson et al, 2000).

In this study, significant differences were observed in overall interaction, learner-learner and learner-instructor interaction across the four formats of distance education instruction. Course-in-a-Bag (a one-way transmission media) offered the least amount of learner-learner and learner-instructor interaction. Instructional television courses also offered less learner-learner and learner-instructor interaction than online and mixed mode courses. Online and mixed mode formats provided the most overall interaction compared to Course-in-a-Bag and instructional television. Additionally, mixed mode formats provided the highest means for learner-learner and learner-instructor interaction when compared to Course-in-a-Bag and instructional television formats.

These findings are consistent with previous research on interactivity capabilities of distance education instruction. However, this study does not seem

to support the criticism of online learning as an isolating format that lacks interaction.

Null Hypothesis Six. The sixth null hypothesis indicated that no significant difference existed in student satisfaction across the four formats of instructional delivery. Results from the ANOVA testing indicate that significant differences were found in satisfaction across the formats of delivery. Post hoc Scheffé analysis suggested that students reported significantly higher satisfaction means in online courses (M=3.578) when compared to instructional television courses (M=3.292).

> *Conclusion Five.* Students' perceptions of satisfaction were significantly different in courses offered in different formats of distance education instructional delivery. Specifically, students' perceptions of satisfaction were significantly higher in online courses as compared to instructional television.

The literature suggests that community college students place value on convenience in their education (Noel-Levitz, 2005). Adult students take distance education courses because they provide flexibility in their schedule (Miller & Honeyman, 1993, Muirhead, 2000). Interaction is also an important predictor of satisfaction in distance education courses (Allen & Seaman, 2004; Fulford & Zhang, 1993).

Studies indicate that barriers to satisfaction exist in most forms of distance education. For example, although some students reported satisfaction with videotaped instruction due to the convenience and flexibility (Schittek Janda et al,

2005), studies by Murphy (2000) and Packer et al (2001) indicated that one-way videotaped instruction was less satisfactory when compared to live instruction.

In general, instructional television students reported higher satisfaction with their courses when they had sufficient learner-instructor and learner-content interaction (Kelsey, 2000; Sherry, Fulford, & Zhang, 1998). Community college instructional television students' satisfaction was reported to be related to learner-instructor and learner-content interaction (Bower, Kamata, & Ritchie, 2001; Inman, Kerwin, & Mayes, 1999). Finally, quality of technology influenced satisfaction with instructional television students (Hackman & Walker, 1990; Valentine, 2002).

Online students reported higher satisfaction means in courses where they had more learner-learner and learner-instructor interaction (Swan, 2001). Learner-instructor interaction was reported to be more important in influencing satisfaction than learner-learner interaction for online courses (Swan, 2000). However, a study by Jung (2002) suggested that the learner-learner relationship may be more influential on satisfaction.

Mixed mode courses combine face-to-face instruction with online instruction in various combinations (Garrison & Kanuka, 2004). The addition of a face-to-face component can make this method of instructional delivery less flexible and potentially less satisfying (Anderson, 2004). However, the literature also indicated that the addition of an online component can increase learner-learner interaction, learner-instructor interaction and satisfaction (Irons, Keel, & Bielema, 2002; Twigg, 2003).

In this study, satisfaction means in every format of instructional delivery were between three (*sometimes)* and 4 (*frequently*) on the Likert scale of measurement. Although satisfaction means were relatively high in all formats, significant differences were observed in satisfaction between instructional television courses (M=3.292) and online courses (M=3.578). Online courses had the highest satisfaction means over all other formats but were only significantly higher than instructional television courses.

This study supports the existing literature by reinforcing that both format and interaction are important contributors to satisfaction in distance learning courses for community college students. The study revealed highest student satisfaction means in online courses. Online courses provided the next to highest means of both learner-learner and learner-instructor interaction when compared to mixed mode courses. Interestingly, mixed mode courses, while providing the most learner-learner and learner-instructor interaction were not perceived by students to be the most satisfying format of instructional delivery. It is possible that the required face-to-face component in the mixed mode format of instruction limits the flexibility and convenience of the format and therefore makes it slightly less satisfying to the community college student.

Research Question Three. The third research question of the study explored the presence of relationships between each of the four types of interaction and satisfaction in the four formats of instructional delivery. Four null hypotheses addressed this research question.

Null Hypothesis Seven. The sixth null hypothesis suggested that no relationship existed between learner-learner interaction and satisfaction in the four formats of instruction. Pearson Product Moment correlation coefficients indicated that a significant relationship did exist between learner-learner interaction and satisfaction in all four formats of instructional delivery.

Conclusion Six. Learner-learner interaction was positively related to satisfaction in all four formats of distance education instructional delivery.

Literature indicated that learner-learner interaction is important in distance education because it provided the opportunity for collaboration, knowledge construction, and knowledge testing (Moore & Kearsley, 2005; Wegerif, 1998). Course-in-a-Bag formats are satisfying because they are flexible (Miller & Honeyman, 1993; Schittek Janda et al, 2005). However, the independence of time and place in Course-in-a-Bag formats results in the loss of some learner-learner interaction (Anderson, 2003b; Schittek Janda et al, 2005).

Studies on instructional television courses indicated that technology can be a limiting factor in providing interaction and satisfaction in this format of instruction (Royal, Bradley, & Lineberry, 2005; Thomerson & Smith, 1996). Instructor-centered strategies such as lecture are often used in instructional television courses leaving little opportunity for sufficient learner-learner and learner-instructor interaction (Dupin-Bryant, 2004; Dillon, Hengst, & Zoeller, 1991).

The online format of instruction offers opportunities for learner-learner interaction through asynchronous discussion boards and synchronous chat sessions. Online students expect to interact with each other in this format and failure to provide opportunities for learner-learner interaction may impact effectiveness of the course (Hay et al, 2004). Jung (2002) suggested that students in online courses that encouraged learner-learner interaction were more satisfied with their learning process.

Mixed mode classes offer the opportunity for learner-learner interaction usually seen in the traditional classroom combined with the opportunities for learner-learner interaction available through the online format. The creation of an online learning community is possible in mixed mode formats which can increase collaboration and knowledge building (Bonk & Kim, 2004; Wonacott, 2002). The addition of an online component to create a mixed mode class resulted in increases in the opportunities for learner-learner interaction and increased satisfaction (Twigg, 2003).

This study supports the existing literature by suggesting a positive relationship between learner-learner interaction and satisfaction in all formats of distance education examined. The increased satisfaction in all formats of instruction as learner-learner interaction increases is consistent with the previous research on learner-learner interaction in each format of instruction.

Null Hypothesis Eight. The seventh null hypotheses stated that no significant relationship existed between learner-instructor interaction and satisfaction in the four formats of instructional delivery. Results from correlation

testing suggested that a significant relationship does exist between learner-instructor interaction and satisfaction in all four formats of instructional delivery.

Conclusion Seven. Learner-instructor interaction was positively related to satisfaction in all four formats of distance education instructional delivery.

The separation of the learner from the instructor in distance education can make learner-instructor interaction extremely important. The literature indicated that learner-instructor interaction is regarded as essential by instructors and desired by learners in distance education formats (Anderson, 2003; Garrison & Shale, 1990; Moore & Kearsley, 2005). Learner-instructor interaction is essential for the student to check and verify newly constructed knowledge against the expertise of their instructor (Garrison & Shale, 1990). A study by Tallman (1994) indicated that interaction with the instructor through feedback concerning assignments was a significant predictor of student satisfaction in one-directional video courses. In contrast, weekly opportunities for interaction in a Course-in-a-Bag format course were not enough to make distance students as satisfied as the traditional face-to-face format students (Murphy, 2000).

Several studies on instructional television formats indicated that learner-instructor interaction is important in student satisfaction. One study revealed that instructional television students communicated with instructors more frequently than traditional face-to-face students and the creation of community was possible (Bischoff et al, 1996). Similarly, Sherry, Fulford, & Zhang (1998) conducted a study that measured perceptions of interaction in instructional television courses which suggested that learner-instructor interaction is important. Finally, a 2000

qualitative study indicated that learner-instructor interaction was the most enjoyable for the student participants (Kelsey, 2000).

In this study, a significant positive relationship was observed between learner-learner interaction and satisfaction for all formats of instructional delivery studied. These findings are consistent with the literature on the importance of learner-instructor interaction to student satisfaction in distance education courses.

Null Hypothesis Nine. The eighth null hypothesis stated that no significant relationship existed between learner-content interaction and satisfaction in the four formats of instruction. Correlation testing indicated that a significant relationship existed between learner-content interaction and satisfaction in the Course-in-a-Bag, online, and mixed mode formats of instruction.

Conclusion Eight. Learner-content interaction was positively related to satisfaction in Course-in-a-Bag, online, and mixed mode formats of instructional delivery.

A few studies were conducted on learner-content interaction in distance education. According to the literature this form of interaction is critical in distance learning. Through learner-content interaction, new information is integrated into previously existing cognitive structures which helps reshape the perspective of the student (Moore & Kearsley, 2005; Moore, 1989). Course-in-a-Bag students all received their content in a uniform manner. However, each student interacted with that content, through their assignments, in their own manner (Moore, 1989).

Measurements of student interaction in instructional television courses in 1998 suggested that learner-content interaction is important for both undergraduate and graduate students (Sherry, Fulford, & Zhang). Additionally, Inman, Kerwin, and Mayes (1999) studied community college students and discovered that the indirect interaction with the instructor through the prepared materials (content) was a significant predictor of student satisfaction. Technology that functions properly to facilitate the transfer of content makes instructional television courses more satisfactory (Hackman & Walker, 1990, Valentine, 2002). Finally, Swan (2002) indicated that frequent interaction with content in an online environment increased student satisfaction.

Students in online and mixed mode courses must adapt to their new environment and learn to search for information that is usually provided directly by the instructor (Clark 2001). Adaptation can come through the formation of a learning community which benefits distance learners by opening up opportunities for knowledge acquisition (Palloff & Pratt, 1999; Wonacott, 2002).

In this study, a significant relationship was found between learner-content interaction and satisfaction in all formats of instructional delivery except instructional television courses. A higher learner-content interaction score from the *Interaction and Satisfaction Survey* may indicate that students have consistently acquired their content from more than one source. These results were consistent with the literature that suggested that the interaction with content in distance education courses was important to student satisfaction.

Null Hypothesis Ten. The final null hypothesis suggested that no significant relationship existed between learner-technology interaction and satisfaction in the four formats of instructional delivery. Results from the correlation testing indicated that a significant inverse relationship did exist between learner-technology interaction and satisfaction in the instructional television and online format of course instruction.

Conclusion Nine. Learner-technology interaction was inversely related to satisfaction in the instructional television and online formats of instructional delivery.

Learner-technology interaction depends upon the ability of students to navigate the technology required for their courses successfully (Hillman, Willis, & Gunawardena, 1994). This type of interaction is important because it determines how easily a student will interact in his/her environment and make meaning from course content (Hillman, Willis, & Gunawardena; Vrasidas, 2000). Previous studies suggested that difficulties with technologies can create barriers to interaction in instructional television courses (Comeaux , 1995). Hackman and Walker (1990) observed that satisfaction is highest in instructional television when technology performs correctly. Learner-technology interaction in mixed mode and online formats may also be influenced by the complexity associated with online technologies (England, 1985; Johnson et al, 2000).

In this study a significant negative relationship was observed between the learner-technology interaction and satisfaction in instructional television and online instructional deliveries. The questions from the *Interaction and*

Satisfaction Survey quantified learner-technology interaction based on five questions. The first question quantified the amount of experience the student had with the technology required for the surveyed course. The remaining four questions quantified the difficulty the student had with the technology required for class and the influence interaction with the technology had on performance and participation. A high mean learner-technology interaction score may indicate that the student had particular difficulty with the technology required for their course. Difficulty with technology may result in reduced amounts of satisfaction thus resulting in a negative correlation. These results are consistent with previous research on the potential barriers technology can pose to satisfaction in a distance education course.

According to Gorsky and Caspi (2005), Moore's theory lacks studies that relate transactional distance to learning outcomes. The results from research question three add to Moore's theory by relating interaction and assumed transactional distance to satisfaction. Moore suggested that as interaction increased, transactional distance should decrease. The data suggests that as learner-learner and learner-instructor interaction increases in any format of instructional delivery, satisfaction increases as well. Assuming that transactional distance decreases as interaction increases then we can begin to link interaction to transactional distance and satisfaction.

General Recommendations

Distance education is a popular form of higher education that is expected to continue gaining popularity in the future (Howell, Williams, & Lindsay, 2003). An ongoing criticism of distance education is the potential lack of quality compared to traditional face-to-face instruction. Satisfaction is one good indicator of quality of distance education that can be easily quantified. Moore's *Theory of Transactional Distance* suggested that as interaction in the form of dialogue increases, transactional distance may be reduced which may increase learning outcomes such as satisfaction. The literature indicated that interaction varied depending on the format of instructional delivery (Anderson, 2004). Previous studies in higher education also emphasized the importance of learner-learner, learner-instructor, learner-content, and learner-technology interaction to success and satisfaction in courses offered in distance education instructional delivery formats.

This study provides additional support for the importance of interaction on satisfaction in distance education in higher education. The following are specific recommendations derived from the study and relevant literature that may help to increase interaction, satisfaction and quality of distance education for the future.

Recommendation One. Opportunities for learner-learner interaction should be offered in all formats of distance education course delivery to increase student satisfaction.

The study found significant differences in learner-learner interaction between courses offered in four formats of instructional delivery. Less interactive

formats like Course-in-a-Bag and instructional television courses offered the least amount of learner-learner interaction while more interactive formats such as online and mixed mode offered more learner-learner interaction. Additionally, a significant positive correlation between the amount of learner-learner interaction and satisfaction was observed for all formats of instruction. Increasing the opportunity for learner-learner interaction in all formats of instruction may increase the perceived student satisfaction and positively impact the quality of the distance education course.

Recommendation Two. Opportunities for learner-instructor interaction should be offered in all formats of distance education course delivery to increase student satisfaction.

Moore & Kearsley (2005) indicated that most educators regard learner-instructor interaction as essential. The importance of this type of interaction is paramount as the learner verifies the accuracy of their new knowledge against the reference of the instructor (Garrison & Sahle, 1990). Learner-instructor was shown to be critical to students in Course-in-a-Bag (Tallman, 1994), in instructional television (Bischoff et al, 1996; Sherry, Fulford, & Zhang, 1998; Kelsey, 2000), in online (Jung, 2002, Soo & Bonk, 1998), and in mixed mode formats (Irons, Keel, & Bielema, 2002; Twigg, 2003).

Although the learner-instructor interaction means were high for all formats of instructional delivery, this study found significant differences in learner-instructor interaction between courses offered in four formats of instructional delivery. Less interactive courses such as Course-in-a-Bag and instructional

television had lower means in learner-instructor interaction than more interactive courses such as online and mixed mode formats. A significant positive correlation was also observed between learner-instructor interaction and satisfaction in all formats of instructional delivery. Increasing the learner-instructor interaction in all formats of distance education may increase student satisfaction and improve the overall quality of the courses.

Recommendation Three. Instructional content should be offered from many sources in all formats of instructional delivery to increase the amount of learner-content interaction for the students and as a result increase satisfaction.

Distance education has provided the opportunity for learner-content interaction in entirely new ways. Traditionally, learner-content interaction occurred between a student and the text (Anderson, 2003). The implementation of technology in distance education allows learner-content interaction to occur through videotape, teleconference, virtual labs, or computer assisted tutorials (Anderson, 2004; Peters, 2000). Previous research has suggested that students in instructional television courses are more satisfied with their courses when they have convenient access to content (Miller & Honeyman, 1993; Royal, Bradley, & Lineberry, 2005b). A significant positive relationship was observed between learner-content interaction and satisfaction in Course-in-a-Bag, online, and mixed mode formats of instructional delivery. Offering content conveniently and from a variety of sources may improve course quality and student satisfaction.

Recommendation Four. Potential obstacles with the technologies should be addressed with the students in every format of instruction before content delivery begins in order to prevent a loss of student satisfaction.

Previous studies in distance education have suggested that technological problems can influence interaction and satisfaction in distance courses (Hackman & Walker, 1990; Royal, Bradley, & Lineberry, 2005b; Thomerson & Smith, 1996). This study indicated that a negative relationship exists between learner-technology interaction and satisfaction in instructional television and online courses. In these two formats of instruction, as learner-technology interaction increased, satisfaction decreased. Difficulties with technology in instructional television courses can completely disrupt communication between remote and host site students. Solution to the technical difficulties often lies outside the control of the students in either classroom. Students in online courses who have difficulties with technology are often working alone or in a computer center with little opportunity to ask the instructor questions. Administrators of distance education courses should realize that technical difficulties in distance education courses can have serious negative consequences on student satisfaction.

Recommendations for Further Study

The results of this study reinforce the importance of learner-learner, learner-instructor, learner-content, and learner-technology interaction on student satisfaction in Course-in-a-Bag, instructional television, online, and mixed mode

formats of distance education. Additional research is suggested using similar samples of students, using samples of students from different institutions, with new technologies, with variables that include transactional distance, and using the qualitative method.

Recommendation One. This study should be replicated to collect similar data on interaction and satisfaction in distance education courses using the *Interaction and Satisfaction Survey* from a similar two-year sample population. Comparison of interaction and satisfaction between this two-year sample and a two-year sample from another institution would further test the validity and the generalization of the results from this study.

Recommendation Two. This study should be replicated to collect similar data on interaction and satisfaction in distance education courses using the *Interaction and Satisfaction Survey* from a four-year sample population. Comparison of interaction and satisfaction between this two-year student sample and a four-year student sample from another institution would expand the validity and the generalization of the results from this study.

Recommendation Three. This study should be replicated using the *Interaction and Satisfaction Survey* as new technologies become available. The pilot study indicated that the *Interaction and Satisfaction Survey* is a valid tool for quantifying interaction and satisfaction in a distance education format. As a

result, it is a useful tool for evaluating new formats of distance education instructional delivery.

Recommendation Four. Modification of the study to include a quantification of transactional distance is needed. This study supports Moore's *Theory of Transactional Distance* by emphasizing that interaction is an important contributor to satisfaction in four formats/environments of distance education. Additional research on transactional distance would help add to the body of knowledge and assist administrators as they try to perfect the distance education format in higher education for today and for the future.

Recommendation Five. This study should be expanded by conducting qualitative research to further investigate factors that result in satisfaction for community college distance education students. It is apparent from this study that perceived interaction is related to student satisfaction. However, because distance education students are so diverse, this relationship may be very complex. A qualitative study may help add to the body of knowledge concerning factors that influence satisfaction for community college students.

Limitations

The convenience sampling of students at a single community college limits the generalizability of the findings from this study. Since invitations to participate in the survey were sent by e-mail, data collection was further limited to

students who had an e-mail address with the community college. Generalizability within the institution also was limited by the response rate of 18.2%. The sample for this study consisted of two-year distance education students enrolled in various formats of instructional delivery. The results on interaction and satisfaction derived from this study are limited to these students and cannot be generalized to a traditional format.

APPENDICES

Appendix A

Invitation to Participate in Survey Research

From Display Name: TTC Institutional Research
From Email address: TTCresearch@tridenttech.edu
Reply to Email address: TTCresearch@tridenttech.edu

Subject line: TTC Distance Learning Courses

In an effort to improve Trident Technical College's distance learning courses, we need your help. We are asking all distance learning students to respond to the following survey questions no later than September 24: [begin survey here]

Your responses will remain confidential and your help will be appreciated.

Thank you.

Appendix B

Interaction and Satisfaction Survey

Please indicate the type of course you are currently enrolled.

_____Course in a bag (one way video recorded tapes)
_____Interactive TV (two-way live audio/video)
_____Online (Internet)
_____Mixed Mode (Internet and face-to-face)
____Berkeley
____Main
____Palmer

Instructions: Using the choices provided, please answer the questions by marking the most appropriate choice.

- Gender: M F

- Ethnic Origin:
  African American
  American Indian/Alaskan Native
  Asian/Pacific Islander
  Caucasian
  Hispanic
  Other

- County of Residence:

Berkeley Charleston Dorchester Other SC County Out of State

- Student Status:
  Full time (12 or more semester hours)
  Part time (<12 semester hours)

- Age:

< 18 18-25 26-34 35-44 45-54 55 and over

- College Program: Associate Degree Diploma Certificate

- Number of Distance education courses taken prior to this term:

0 1-2 3-4 5-6 7-8 9-10 >10

Please answer the following questions about your current distance education course using the scale below:

N = never R = rarely S = sometimes F = frequently

Learner-to-Learner

1. Course activities require me to interact with other students.	N	R	S	F
2. I initiate interaction with other students in the course.	N	R	S	F
3. I ask questions of other students in my course.	N	R	S	F
4. I respond to questions from other students in my course.	N	R	S	F
5. I reply to messages from other students in the course.	N	R	S	F
6. Course activities require me to work in groups with other students.	N	R	S	F
7. Course activities require students to share results of group work with the entire class.	N	R	S	F
8. There was positive interaction between other students in the course and me.	N	R	S	F

Learner-to-Instructor

9. Course activities require me to interact with the instructor in the course.	N	R	S	F
10. I respond to questions from the instructor.	N	R	S	F
11. I reply to messages from the instructor.	N	R	S	F
12. I initiate interaction with the instructor.	N	R	S	F
13. I ask questions of the instructor in the course.	N	R	S	F
14. The instructor responds to my questions.	N	R	S	F
15. There was positive interaction between the instructor and me in the course.	N	R	S	F

Learner-to-Content

16. I receive instructional materials and course information by Internet.	N	R	S	F
17. I receive instructional materials and course information by E-mail.	N	R	S	F
18. I receive instructional materials and course information by Video/DVD.	N	R	S	F
19. I receive instructional materials and course information by telephone.	N	R	S	F
20. I receive instructional materials and course information in person (face-to-face delivery).	N	R	S	F
21. I receive instructional materials and course Information by postal mail.	N	R	S	F

Learner-to-Technology

22. I have used the technology required for my current class.	N	R	S	F
23. I had problems with the technology required for my current class.	N	R	S	F
24. I asked for assistance with the technology required for my current class.	N	R	S	F
25. Problems with the technology required for my current class prevented me from completing assignments.	N	R	S	F
26. Problems with the technology required for my current class prevented me from participating in my class.	N	R	S	F

Student Satisfaction

27. I am satisfied with the interaction with the instructor.	N	R	S	F
28. I am satisfied with the interaction with other students.	N	R	S	F
29. I am satisfied with course activities.	N	R	S	F
30. I am satisfied with how I receive course materials and information.	N	R	S	F
31. I am satisfied with the technologies being used in the course.	N	R	S	F
32. I am satisfied with the technical support provided for the course.	N	R	S	F
33. I am satisfied with the technical support for the course (i.e., library resources).	N	R	S	F
34. The subject matter in this course was presented effectively.	N	R	S	F
35. Overall, I am satisfied with this course.	N	R	S	F
36. I would recommend a distance learning course to another student.	N	R	S	F
37. I would take another distance learning course in the future.	N	R	S	F
38. If I had a choice, I would choose a distance education course over a face-to-face course.	N	R	S	F

Appendix C

Institutional Review Board Application Approval

Date: Thu, 08 Jun 2006

Dear Dr. Williams:

The Chair of the Clemson University Institutional Review Board (IRB) validated the proposal identified above using the Exempt review procedures and a determination was made on **June 8, 2006** that the proposed activities involving human participants qualify as Exempt from continuing review under **Category 1** based on the Federal Regulations. You may begin this study.

Please remember that no change in this research proposal can be initiated without prior review by the IRB. Any unanticipated problems involving risks to subjects, complications, and/or any adverse events must be reported to the IRB immediately. The Principal Investigator is also responsible for maintaining all applicable protocol records (regardless of media type) for at least three (3) years after completion of the study (i.e., copy of validated protocol, raw data, amendments, correspondence, and other pertinent documents). You are requested to notify the Office of Research Compliance (ORC) if your study is completed or terminated.

Attached is a document developed by Clemson University regarding the Principal Investigator's Responsibilities.

Good Luck with your study and please feel free to contact us if you have any questions. Please use the IRB number and title in all communications regarding this study.

Daniel Harris
IRB Program Assistant
Office of Research Compliance
223 Brackett Hall
Clemson University

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